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ABSTRACT

Part of a series devoted to the topic of career education in transportation, this manual, which is intended for use by students in grades 11 and 12, is composed of three units designed to aid in preparing students for entry level positions or postsecondary education in the field of transportation. Unit I, which is concerned with the student's general development, includes such subjects as sources of occupational information, maps, paperwork, women's role in the world of work, labor unions, education, and job application skills. Unit II treats specific skills required by various careers in transportation: (1) tracing the origin and flow of power through a transportation system; (2) computing the cost of operating an automobile; (3) computing the cost of operating a truck; (4) performing routine automotive transportation maintenance; (5) cleaning and gapping a spark plug; (6) tuning a four-cycle engine; (7) buying used transportation; (8) monitoring surface transportation noise; (9) advancing in the retail car and truck business; and (10) developing one's own job in transportation. For each of these skills, the following items are provided: student objectives, related occupations, background information, implementation of learning activities, resource materials, and student worksheets. Unit III introduces the student to the idea of entrepreneurship in the transportation business. (A teachers' guide for a career preparation program to be used in conjunction with this student manual is published separately, CE 013 881.) (ELG)

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PREPARATION
OF
CAREERS IN TRANSPORTATION

Student Manual

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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UNIT I

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INFORMATION

Where To Get It

There are said to be more than 20,000 occupations in existence. This figure is, of course, an estimation. But it does point to a number of problems. For one, how do you go about narrowing things down when you get ready to start seriously thinking about jobs and discover that so many exist? Well, there are several good places to start. Your school guidance counselor is one. Your teacher — especially the teacher of your favorite subject — is another.

One of the important things about making such a choice as that of a career is knowing how such things are classified. We form generalizations about things, place them in categories and label them, for good reason. It makes the process of locating what we want much easier — usually. But before launching any searches for things it is important to know some of the ways they are categorized, or grouped together.

There are two sources of information about occupations which are vital to anyone looking for a job. These are the Dictionary of Occupational Titles and the Occupational Outlook Handbook. They are just packed with important information. However, the information they contain is arranged very differently. For instance, each has its own system for grouping occupations. The DOT, which is the most basic source of occupational information available in the United States, is published by the U. S. Department of Labor. It tries to list every occupation that exists.

But, as you might suspect, that Hurculean task is all but impossible. The DOT doesn't just list occupations. It tells what is done by those occupations, how it is done and why it is done. It tells what kinds of aptitudes are required on a particular job and what kinds of personality types are best suited for the work involved. The DOT classifies the occupations it lists according to nine basic categories. These are:

1. Professional, technical and managerial
2. Clerical and sales
3. Service
4. Farming, fishing and forestry

5. Processing
6. Machine trades
7. Bench work
8. Structural work
9. Miscellaneous

The occupations listed within these groups in the DOT carry a six-digit code. The code refers to the involvement each occupation has with people, data and things, as well as other things. How would you rank yourself in terms of these categories?

Are you good at working with people?

Are you good at working with data? (ideas)

Are you good at working with things? (tools)

Let's take a look at some transportation occupations (the way we have defined transportation occupations according to your book INTERMODAL TRANSPORTATION OCCUPATIONS: AN OCCUPATIONAL CLUSTER PARADIGM).

Try matching up the appropriate occupations with what you think they would be mainly involved with:

_____ Working with data	A. Airline ticket agent
_____ Working with people	B. Air controller
_____ Working with things	C. Truck driver
_____ Working with data and people	D. Personnel director
_____ Working with data and things	E. Mechanic
_____ Working with people and things	F. Travel agent
_____ Working with data, people and things	G. Ship's steward

Can you find duplication in any of the above "educated guesses" you have made? Look up these and other occupations in the DOT and see what it has to say about them in terms of involvement with these three things.

Another vital source of information, one that is certainly more readable and interesting, is another Department of Labor publication, the Occupational Outlook Handbook. It has adopted a system of categorization common to most of career education and pioneered by the U. S. Office of Education. That concept, known as occupational clustering, groups occupations into 15 groups. The most general statement that can be made about the differences in grouping between the DOT and the OOH is that the DOT groups jobs according to what people do, whereas the OOH groups jobs according to where people do them. This is a bit of an oversimplification, but holds true for most of the 20,000 plus occupations classified.

Here are the OOH clusters:

Agribusiness and natural resources
Business and office
Health
Public services
Environment
Communication and media
Hospitality and recreation
Manufacturing
Marine science
Marketing and distribution
Personal services
Construction
Consumer and homemaking
Fine arts and humanities
Transportation

In looking through the OOH you should recognize that many occupations which you might consider transportation are indeed classified elsewhere. In fact, the Transportation Curriculum Project has attempted to combine the WHERE people work with the WHAT they do to come up with a reasonable system of classification of its own.

--Look up a couple of occupations of your choice in both the DOT and OOH. Which provides a more useful description?

--What other ways could occupations be classified?

--Refer to the Occupations Finder in John Holland's Self Directed Search to try to identify transportation occupations? Based on the following descriptions, what category of occupations/ personality types do you fall into?

Realistic — Technical and skilled trades, working together.

Intellectual — Scientific occupations, working mainly with ideas and things.

Social — Teaching and helping occupations, working with people.

Conventional — Clerical occupations, working with data.

Enterprising — Supervisory and sales, working with people and things.

Artistic — Artistic, literary, musical occupations, working with data and things.

--Select an occupational preference in transportation and locate it in the OOH, if you can. What does it say about:

Nature and location of the occupation_____

_____

Places of employment_____

Education and training required_____

Employment outlook_____

_____

Earnings and working conditions_____

_____

THE NEWSPAPER

The newspaper is a conveyer of much information that is related to transportation. Pick up a metropolitan newspaper and a smaller paper, if you live in a town or something smaller than a city, and see how many different things on the front page relate to transportation. How much other news can you find that is transportation-related? Try making a scrapbook of transportation news and pictures from newspapers, magazines and other places. This is a good way to relate to local, national and international problems concerning transportation. Now look to the want ads section — under jobs available. How many are transportation-related?

Name some: _____

_____

_____

Are there any salaries listed? What are they?

OCCUPATION:

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Clip some of these want ads and share the information with classmates. Do any appeal to you? What are the requirements for obtaining the job? How much education and training is required?

_____

_____

_____

In examining all the information you have accumulated on transportation from the newspaper, can you form any conclusions about how transporters of people and goods use the newspaper? What are a few?

_____

_____

_____

Communication is, of course, a vital function in the operation of any business. And businesses, transportation included, rely heavily upon many forms of communication for many different reasons. The bus company wants its customers to know of the convenience and efficiency it affords commuters. But it is having a very hard time making money, what with equipment and salaries and all those cars. What could you, as a public relations agent for a metropolitan bus company — a transit authority that is in jeopardy — do by using the newspaper to influence business? How about other forms of the media — like television, radio, etc.?

MAPS

Maps are convenient and efficient tools of communications which many persons involved in transportation use to great advantage. In fact, people in many different occupations — transportation and otherwise — use maps daily in the performance of their occupational tasks. Maps serve a wide degree of usefulness. They serve geologists, oceanographers, navigators, truck drivers and meteorologists. And many others.

There are a number of different kinds of maps. Some maps depict bodies of land and water and some depict the heavens. Others depict the layers of rock which underlie the earth itself.

How many different transportation occupations can you think of or find out about which use maps in their day-to-day work?

List some:_____

_____

_____

There are several different types of maps. Do any of the above occupations use more than one type of map? How many different types are used by people involved in transporting goods and other people?

List some:_____

_____

_____

Bring to class one or more examples of maps. Maybe a reward of some kind should go to the one who brings in the most unusual map.

Break out a road map and make believe for a moment that you are a truck driver. You are an independent trucker, so efficiency is very important to you, for although you enjoy the benefits of being your own boss, you also must depend solely upon your ability to manage all facets of the operation efficiently and effectively. You are leaving San Jose, California, for Las Vegas, Nevada, with a load of poker chips that must be there soon for the opening of a new casino. After unloading your chips in Las Vegas you will get a night's sleep (what does the law say about truckers and the maximum hours they can drive?). Then you will pick up some fresh produce across town from the casino and carry it to Albuquerque, New Mexico. From there you will head for San Francisco with a load of something else and then home to San Jose. Chart your trip on the road atlases available to you and find out:

How many miles (approximate) you travelled_____

How many total hours it took_____

About how many nights you were away from home_____

Try plotting some probable trips via oceanliner, airplane and other form of conveyance on various other maps.

Get hold of a map of your city and take a good look at it. Where do you live? Where is your school?

On a map of your state, which highways do you think are the most important? List the five you would judge most important.

_____

_____

_____

_____

_____

On what basis did you choose these?

What do the following terms mean?

cartographer_____

topographic_____.

relief map_____

contouring_____.

What can you find about the history of maps? And what do you think of the importance of maps to man?

PAPER WORK

Do you take accurate notes in class? Keep a neat notebook in school? Are you good with figures and quick to total them? Do you find it easy to keep files and records? If you can answer YES to any or all of these questions, then there are literally thousands of different jobs within transportation which could be good ones for you. You might think a person good at any of these things would be an introverted person. Not always so. Take a nurse, for instance. He or she needs to be both extroverted and a good keeper of medical records.

What kinds of occupations that are translation-oriented make use on a day-to-day basis of records, files, paperwork?

List a few:_____

_____

_____

There are, of course, some obvious ones. Like a billing clerk in a trucking company. Or an airplane navigator. How about a truck driver? Airline Stewardess? What occupational groups or families mentioned in the technical volume INTERMODAL TRANSPORTATION CAREER EDUCATION: AN OCCUPATIONAL CLUSTER PARADIGM are more likely to be heavily involved with paperwork?

_____

_____

Attached are some data, information, record task sheets from actual transportation companies. Examine them, fill them in with imaginery orders, figures, whatever. See if you can determine what kinds of information they keep track of and why it is kept track of.

WOMEN AND WORK ROLES

The notion that man is the breadwinner in the family and woman still belongs in the kitchen is obviously on the way out. It is becoming ever apparent in our changing society that women can and will do any and all work that men can and will do. Or is it? The question of whether or not women wish to continue the stereotyped role of mother-housekeeper to the exclusion of some other activity — work — is one that each individual woman must decide. However, the notion that some jobs should be left for men or that women are unfit to occupy certain career roles is not. It has been legally declared unconstitutional — years too late for many women, unfortunately — to discriminate job-wise according to sex.

The fact that it is unconstitutional does not, unfortunately, mean that job discrimination doesn't go on any longer. It does. All over the place. It has just taken on a more subtle appearance. The area of Transportation occupations is replete with examples of women who are seeking out and achieving career goals heretofor considered "men's work". There have been stories of women truck and bus drivers, airline pilots, mechanics and many more. And, do you know what? If you get on an airplane you are likely to run into a steward — that's male for stewardess, you know. You see, job discrimination has worked both ways.

The notion that women can and should be educated and trained for any kind of occupation is long overdue, but it is surfacing and being reinforced by women everywhere. Can you think of any women you know who have what might have been considered unusual jobs a few years ago?

Try listing some:_____

_____

_____

One of the things that has given rise to women's liberation and the idea that women are qualified for much, much more than men have given them credit for, is the fact that for the last several years many women have had to become employed to help carry the financial load for the family. Husband needs wife's income in many instances. Do you know any mothers who work outside the home? How many of them also work as housewives? And how many husbands consider domestic chores like cooking and washing dishes and cleaning house strictly feminine? There are many attitudes to question nowadays. What women should and can do is a major topic of controversy. Think about it. What are your views? A lengthy class discussion is certainly in order on this issue, if you have not had one before. Do you think of any particular occupations women are not, in your opinion, suited for? If so, list some and share the list and your reasons with others — especially classmates and parents.

_____

_____

_____

How about talking this one over with MOM and DAD. Who knows, maybe they aren't sure themselves. Oftentimes we take far too much for granted. And the fact that we have considered woman's place in the home for so long is one of those taken for granted far too long.

How do you think the specific role that woman has had cast for her for centuries evolved? Why has it been this way for so long? What role has technology played in freeing women, if any? You could probably stimulate four years of debate/discussion on this very topic — women and work. You'd talk your way right out of this, the International Women's Year (1975).

Try inviting some women who work outside the home to your class to discuss their occupations. There ARE plenty out there who would be happy to share their views, happenings, frustrations and fulfillments with you.

Also, see about getting your teacher or librarian or guidance counselor to order some of the resources available on the subject of women and work. Notably, some of the films discussed by Jeanne Betancourt in her book WOMEN IN FOCUS. Don't miss the chance to view the movie SALT OF THE EARTH by Herbert Biberman, if you ever have the opportunity.

What does the following statement mean to you and how would you apply it to the women's liberation movement?

"Whose neck shall I stand on to feel superior?
I don't want anything lower than me. I want
to rise up and push everything with me as I go."
— Esperanza

If you are a woman, what job would you like to have?

_____

How much money would you like to make?_____

What would you do if you didn't have to worry about money?

_____

_____

LABOR UNIONS AND APPRENTICESHIPS

Someday you might be piloting a ship through the Panama Canal or an airplane across the Atlantic Ocean or a barge down the Mississippi River. If you eventually find yourself in one of those occupational roles, you would probably also be a card-carrying member of Local 391 of the International Brotherhood of Merchant Marines or the United States Airline Pilots Association or the International Association of River and Lake Mariners.

Those names are all fictitious, but the fact remains that no matter what you do for a living, unless you are your own boss or part of that group of people called "management", you will probably be asked to join a union. Or that might be compulsory with the job you have.

Well, what is a labor union and why should you consider joining, much less have to join, one? Labor unions have a long, oftentimes courageous and generally successful, history. They extend back beyond the beginnings of this country and their cause for existence is age old. You might ask your history teacher or English teacher or agriculture teacher or any other, for that matter, about some of the milestones of labor unions. But when you do, bear in mind that people have mixed opinions of labor unions and that many reasons account for these mixed opinions.

In short, unions were formed in most industries, services, and other business-related concerns, to look out for the interests of the working person. The Teamsters union is supposed to be looking out for the interests of truck drivers. Why are the Teamsters necessary to see that truck drivers' interests are protected? Well, in an economy which is plagued by such things as unemployment on a large scale (which is a major problem to Americans right NOW) people who own trucking companies could, conceivably, place an advertisement in your local paper, offering anyone interested in work a job driving a semi-trailer truck — at twenty cents less than the owner presently pays his truck drivers. In a city like East St. Louis, Illinois, where unemployment reached 23 per cent in 1975, there is a good chance lots of hungry and desperate people would apply for those jobs. And then a lot of truck drivers who used to make $7.50 an hour, would be unemployed. And lots of other people who need jobs badly would have them, for $7.30 an hour and the owner would make lots more profit on whatever he transports.

And lots of truck drivers would be former truck drivers — overnight. And then maybe a couple of months later, with unemployment in East St. Louis up to 26 per cent, the same owner decides to run another ad and see about getting some truck drivers who'll work for $6.90 an hour or $4.45.

Well, with the Teamsters around, nobody drives a semi-trailer truck who isn't both qualified and a Teamster. What about freedom of choice? Well, what about those truck drivers who were suddenly out of work? Unions have been called grand and glorious institutions, necessary evils, socialism and lots of other things. Remember differences of opinions? Well, unions are not perfect. They do not purport to be savioristic. But they DO protect working people in many, many ways. They have improved the lot of the working man and woman. And you might even consider them savioristic, if you knew what it was like for, say, coal miners, before labor unions.

Several activities follow, which are intended to launch some self-searching into the subject of unions and their offshoot — the apprenticeship.

Ask your English teacher for some assistance in locating some literary references to labor unions, working conditions prior to labor unions, the origins of apprenticeship, etc. For instance, Charles Dickens paints some vivid pictures of the life of an urban laborer in latter-day England. In fact, Dickens' literary masterpieces did much to heighten public awareness of horrid labor conditions for adults and children and he is given much credit (after-the-fact) for labor reform throughout the world. Share with classmates, stories relating to labor-working conditions, perhaps reporting formally or discussing informally, some of the literature available and stories told by authors of labor and unions. A few resources are listed at the end of this lesson.

What of the history of labor unions? Here is where your history teacher will be of assistance. Ask him or her about resources and also consult the end of this activity for resources on labor history and union history. Who were the Molly Maguires? What was the Red Scare? What was Bloody Williamson? There are many questions which could prompt extensive investigation. And this is an interesting way to cover history.

Visit a local labor union and ask for their literature on their national or international affiliate. Talk with a labor leader, perhaps having him or her visit your school for further discussion with you and others. Find out the specific requirements this or any local union (transportation, if possible) might have — like:

What do union dues cost?
How long an apprenticeship must one serve?
How does one join?
What has the union to show for its efforts on behalf of laborers in its field? Increased wages over the years, added benefits?
What is the unions' strike record? Strike benefits?

EDUCATION AND TRAINING

You are close to finishing high school and are probably aware of many skills and much knowledge gained through your educational experience so far. You have doubtlessly developed some skills and abilities and picked up useful knowledge. But that means you will have lots of company. Lots of people go to school — for varying lengths of time. With a high school education you should be able to compete for many attractive jobs, if you started early enough to prepare. If you go on to junior college and/or college, your job opportunities will probably broaden. Then again, they might grow narrower.

How do you make a decision like: "Should I go on to college?" Or: "Does my high school education prepare me for a desirable job?" These are rough questions and there is no steadfast barometer for getting an accurate reading and then continuing on whatever path the reading indicates is the right one. But there are some important directions to be taken in seeking answers to this and other similar questions.

Like: "Do I have an occupation in mind?"

If the answer to the above question is "YES", then your course is fairly easy. Consult the Occupational Outlook Handbook, the Occupation's Finder to John Holland's Self Directed Search, the U. S. Department of Labor's booklets entitled:

Jobs for Which a High School Education is Required
a College Education is Required
Junior College, Technical Institute or Other Specialized Training Is Usually Required.

Provided you have that occupational preference identified, complete the following:

The job I am interested in is_____

_____

Educational requirements are:_____years of high school

Technical training needed includes_____(approximate) years

at_____
(name a couple of schools, institutes, unions, etc., that apply)

_____

Approximately how much will this cost?_____

Can the skills, knowledge, etc., be obtained elsewhere? Through less formalized education?

_____

How?_____

_____

If you don't have one specific occupation in mind, then try to think of a few possibilities. And the education required (again, try Occupational Outlook Handbook).

OCCUPATION	YEARS-TYPE TRAINING/EDUCATION
_____	_____
	_____
_____	_____
	_____
_____	_____
	_____
_____	_____

MARKETING YOURSELF

When you have decided upon an occupational or career direction and acquired the necessary skills and knowledge to get a job in that field, then you have acquired a whole new set of problems for yourself. It all boils down to GETTING that job. And that isn't as easy as it might seem. For one thing, unemployment is up — WAY UP. And despite the talk of politicians, it might not get a whole lot better. For another, there's lots of competition for that job. What do you think distinguishes you among all those competitors?

One of the first things you need to do in effectively marketing yourself is sit down and make an inventory of your skills, knowledge and capabilities. List such things as:

— Work history — all your jobs, past and present, and the things you liked and disliked about them, why you left them or returned, what you learned from them, etc.

— Skills and abilities — especially the ones oriented toward that job you think you would like to have, not overlooking anything.

— Education — the schools you've attended and what your favorite and best subjects were, any special programs you were in.

— Career goal — even if you have trouble projecting very far off, try it anyhow.

After you have completed this listing of things — a self-inventory of sorts — assemble them neatly into a resume (vita) for presentation to a potential employer. Do this by considering the abovementioned skills and adding additional information, like your age, family status, hobbies and other things.

Then, mostly for the practice, try writing a sample letter of application for employment. If you have a specific real-life job in mind, then make the application letter real too. The realer the better, so to speak. Remember that employers are looking for such things as your ability to express yourself (usually simply and directly), the orderliness of your communication, your confidence in yourself, knowledge of what you are looking for and other things. What other things? Why not take the next step and find out?

The next step would be to attempt to get an interview for a job. You usually can't do this without a letter, phone call, resume, more specific information or any or all of these. You MUST have your information together before the interview, so the prospective employer will be positively impressed. It is difficult to obtain this type of interview before you are finished with school or ready to actually assume the job you are interviewing for. Employers rarely have the time to give you a few practice interviews. However, to get the gist of it, you might try talking (interviewing) to someone who has a job similar to the one you are pointing toward. When you do, you should have some questions already in mind. Like:

What influenced you to choose the job you have?
What training and experience was necessary?
How did you go about finding your job?
What do you find personally satisfying about the job?
What kinds of experiences might help a young person decide he or she would be suited for a similar job?
What jobs do you think you might have in the future?

Now, complete a resume, application letter and, if possible, interview for a job. Did any of the above questions, when asked of a working person, help? How?

UNIT II

SKILL DEVELOPMENT

TO THE TEACHER 23

TRACING THE ORIGIN AND FLOW OF POWER THROUGH A TRANSPORTATION SYSTEM 26

COMPUTING THE COST OF OPERATING AN AUTOMOBILE 31

COMPUTING THE COST OF OPERATING A TRUCK 41

PERFORMING ROUTINE AUTOMOTIVE TRANSPORTATION MAINTENANCE 45

CLEANING AND GAPPING A SPARK PLUG 55

TUNING A FOUR-STROKE CYCLE ENGINE 62

BUYING USED TRANSPORTATION 72

MONITORING SURFACE TRANSPORTATION NOISE 80

ADVANCING IN THE RETAIL CAR AND TRUCK BUSINESS 86

DEVELOPING "MY JOB" IN TRANSPORTATION 92

TO THE TEACHER

These unit lessons for the Transportation Cluster include a listing of the lessons, a listing of representative occupations, and finally, the lessons themselves. Objectives are stated specifically enough to assure the desired performance is attained by the student, but not so rigorously as to restrict the instructor to unnecessary inflexibility.

It is assumed that students will be given information via a number of teaching strategies about both the occupations and the particular segment of the transportation industry cited at the time when the lesson is delivered.

At selected intervals during the completion of activities which relate to the unit lessons, it may be desirable to expose students a number of times to related occupational information by having them peruse job briefs for those occupations which seem of current interest. Job briefs are available from several publications in the local guidance office, two of which are: the Dictionary of Occupational Titles and Occupational Outlook Handbook. These should be used as primary occupational information references to relate what is being done in the laboratory with possible occupational opportunities for the future. Other sources with transportation and related occupational information are listed at the end of each lesson under Resources.

Representative Transportation Related Occupations

Automobile Mechanic	D.O.T. 620.281
Automobile Service Mechanic	D.O.T. 620.381
Automobile Tester	D.O.T. 620.281
Automotive Engineer	D.O.T. 007.081
City Planner	D.O.T. 199.168
Dealership Manager	D.O.T. 185.168
Dealership Salesman	D.O.T. 280.358
Engineer, Equipment Mechanic	D.O.T. 620.281
Engineering Designer, Aircraft Structure	D.O.T. 002.081
Engineering Illustrator	D.O.T. 017.281
Engine Repair Serviceman	D.O.T. 625.281
Marine Engineer	D.O.T. 014.081
Marine Engine Mechanic	D.O.T. 620.281
Mechanic Maintenance Man	D.O.T. 620.281
Mechanical Test Technician	D.O.T. 869.281
Motorcycle Mechanic	D.O.T. 620.281
Motor Vehicle Inspector	D.O.T. 620.281
Partsman	D.O.T. 223.387
Parts Manager	D.O.T. 185.168
Purchasing Agent	D.O.T. 162.158
Railroad Engineer	D.O.T. 005.081
Safety Engineer	D.O.T. 909.128
Safety Inspector	D.O.T. 620.281; 164.284
Service Engineer	D.O.T. 620.281
Service Manager	D.O.T. 620.131
Shop Mechanic	D.O.T. 620.281

Small Engine Mechanic	D.O.T. 620.281
Spark Plug Assembler	D.O.T. 729.884
Tractor-Trailer Truck Driver	D.O.T. 904.883
Transportation Inspector	D.O.T. 168.168
Transportation Superintendent	D.O.T. 184.168
Truck Driver	D.O.T. 905.883; 906.883
Truck Foreman	D.O.T. 909.883
Truck Mechanic	D.O.T. 620.281
Tune-Up Man	D.O.T. 620.281
Vehicle Safety Inspector	D.O.T. 379.384

TRACING THE ORIGIN AND FLOW OF POWER THROUGH

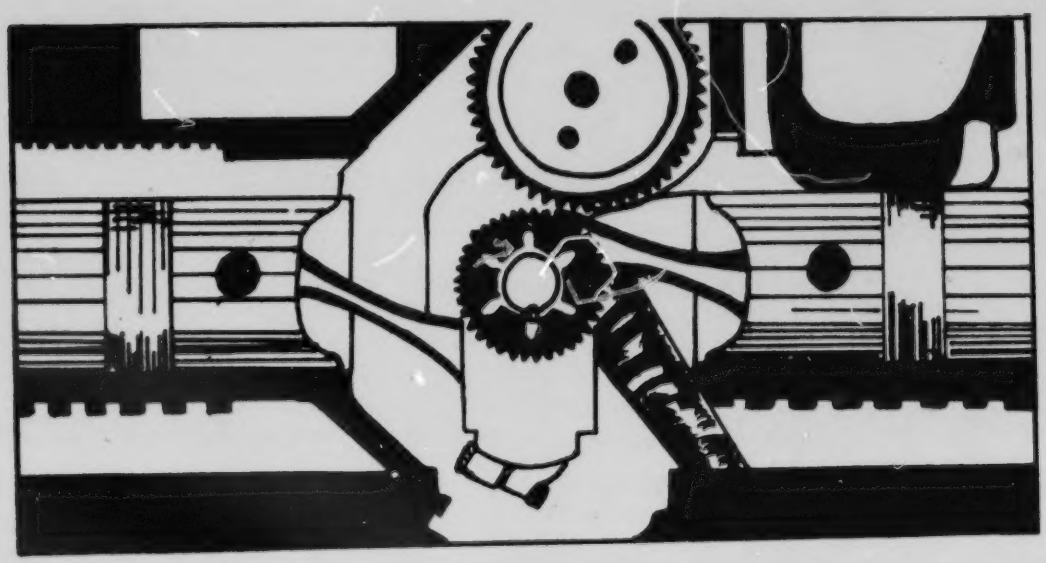
A TRANSPORTATION SYSTEM

Objectives:

1. Traces the power flow through several transportation systems.
2. Develops a visual flow chart and table showing power flow through selected transportation systems.

Related Occupations:

Engineering Designer, Aircraft Structure	D.O.T. 002.081
Railroad Engineer	D.O.T. 005.081
Marine Engineer	D.O.T. 014.081
Automotive Engineer	D.O.T. 007.081
Engineer, Equipment Mechanic	D.O.T. 620.281
Engineering Illustrator	D.O.T. 017.281



Information:

In a very practical sense, transportation moves people and goods from one place to another by land, sea, air and pipeline. Most of the 13 plus percent of our nation's civilian population, however, work primarily in transportation systems related occupations which transport people and goods overland in cars, trucks and buses.

Transportation systems consume energy when they move people and goods from one place to another. In simple terms, the components of the power expended are force which is necessary to move the vehicle, the distance the vehicle moves, and the time interval during which the vehicle is moving between two terminals Power is frequently computed in horsepower hours output of the prime mover or engine for overland transportation systems.

As transportation systems move the assigned cargo, power flows through the system from the source to the use moving the vehicle. For example, when a truck moves freight from New York to Chicago, diesel fuel stored as energy in the fuel tanks is converted by the engine to power which drives the wheels of the truck for as many hours as it takes to move the truck between the two terminal points. The same is true for railroad engines, airplane engines, space ship engines and even the pump which moves goods in slurry through transmission pipelines. The flow of power from the energy source to the use takes several forms. At the well head, for example, energy is stored in the crude oil. At the service station, it is stored in the form of diesel fuel or gasoline. In the internal combustion engine it is converted to heat to drive pistons and the crankshaft, through the transmission and differential to the rear wheels. Finally, what is left over at the engine exhaust is waste heat and fuel residuals, some of which are pollutants.

Energy shortages and pollution problems affect all of us. In the transportation occupations, the problems are particularly severe because most overland vehicles consume fossil oil base fuels which are in short supply and emit pollutants in and around congested cities. Those preparing for transportation occupations whould be very much aware of specific information about power flow through several systems including:

1. The source of fuel which generates the motive force.
2. The power rating of the system.
3. The energy consumption of the system during operation.
4. The flow path of power through the system.
5. The waste heat and pollutants emitted as a result of operating the system.

Implementation:

Each student should first identify a land, sea, air, pipeline or intermodal system of particular interest to them. Key words from both these titles and occupational titles should then be identified which will facilitate a library search of material which will answer the five specific statements about power flow through the system listed above.

Field trips can be conducted to gain first hand knowledge about power flow through transmission systems to such places as truck repair garages, railroad round houses, aircraft repair stations or fabrication facilities, boat docks and shipyards. An alternative would be to have a mechanic or maintenance man from one of these locations come to the class to explain power flow through transmission systems using component parts, wall charts and other visuals. A representative from the state or federal environmental protection agency can explain pollution related issues.

Each student should complete an individual project which presents graphically the flow of power through a specific transportation system showing the efficiency through each stage. As an alternative, a group project can prepare a bulletin board for display in the school.

Resources:

A Power Primer. General Motors Corporation, Detroit, Michigan.

Power Goes to Work. General Motors Corporation, Detroit, Michigan.

Diesel-The Modern Power. General Motors Research Laboratories, Detroit, Michigan.

Transportation Progress: The History of Self-Propelled Vehicles. From Earliest Times Down to the Modern Motor Car. General Motors Corporation, Detroit, Michigan.

STUDENT WORKSHEET

TRACING THE ORIGIN AND FLOW OF POWER THROUGH

A TRANSPORTATION SYSTEM

Instructions:
Identify a land, sea, air, pipeline or intermodal system of transportation. _____

Think of ten or more job tasks associated with this form of transportation. Identify the job title and D.O.T. number. See Dictionary of Occupational Titles for title, D.O.T. number and description of duties.

	JOB TASK	JOB TITLE AND D.O.T. NUMBER
	Drives locomotive	Railroad Engineer D.O.T. 005.081
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____
8.	_____	_____
9.	_____	_____
10.	_____	_____

Define the following words as they relate to transportation:

Engineer:

System;

Power:

Force:

Cargo:

Pollutants:

Fuel:

Answer the following questions as they relate to the land, sea, air, pipeline or intermodal system of transportation you have chosen.

1. What source of fuel is used to move the vehicle?

2. What is the power rating of the system?

3. How much energy is consumed per hour during operation of the system? (i.e. Pound of fuel, Kilowats)

4. Graphically depict the flow of power through the system. Indicate the efficiency through each stage.

5. How much waste heat is emitted as result of operating the system?

6. What pollutants result from operating the system?

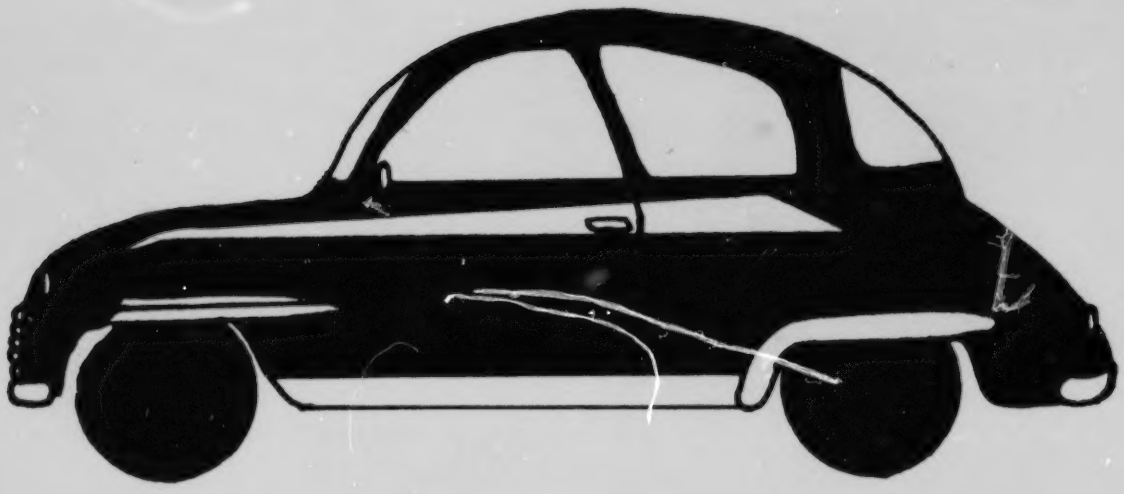
COMPUTING THE COST OF OPERATING AN AUTOMOBILE

Objectives:

1. Identifies make model and year of study vehicle.
2. Projects ten year driving and cost history.
3. Computes cost history on a per year, per mile and total basis.

Related Occupations:

Purchasing Agent	D.O.T. 162.158
Transportation Inspector	D.O.T. 168.168
Transportation Superintendent	D.O.T. 184.168



Information:

American motorists spent more than $20 billion last year for new automobiles. Many of these new car owners may not be aware that, except for buying a home, they will never purchase anything nearly as expensive as their automobiles. But beyond this, they probably have little notion of how much their cars cost to own and operate. Of course, at the time of purchase, they have the choice of buying the size vehicle they wish, and they can choose from seemingly endless lists of optional equipment items, but that is just the beginning. The purchase price is only the first step in a long line of costs that must be paid in moving and maintaining the car during its approximate 100,000 mile, 10-year trip from the assembly line to the junkyard. During this period the standard size car owner will pay $4000 for some 7,350 gallons of gasoline. He will pay $2,147 to keep the vehicle maintained and in repair, $1,350 to insure it, and over $1,800 for garaging, parking and tolls. His State and Federal automotive tax bill, most of which goes to support the roads he drives on, will amount to $1,319 — about 9.7 percent of total costs. Many ownership and operation costs for the typical compact and subcompact cars are not comparable to those of the standard size car, because of the assume items of optional equipment on each car and their effect on costs. However, the automotive tax portions of the costs for each car should be comparable. These taxes total $1,027 for the compact car, and $821 for the subcompact car — 9.5 percent and 8.7 percent respectively of total costs.

The State and Federal tax component of the automobile costs has varied by less than one percentage point during the 20 year period 1950-1970 (10.9 percent in 1950 to 11.4 percent in 1970). Present taxes for the standard size automobile are approximately 9.7 percent of total costs, down 1.7 percentage points from those in 1970. However, all but a negligible amount of this tax reduction was due to the repeal of the Federal excise on new automobiles, effective August 15, 1971. Since highway-user taxes provide the financial support for highways, and the Federal automobile excise has never been available for this purpose, the relative portion of total automotive costs available for highway financing has remained fairly stable. Many local jurisdictions tax motor vehicles and their use in a manner similar to the State registration taxes and motor-fuel taxes. Also, several States levy personal property taxes on motor vehicles. Any computations of the cost of owning and operating an automobile in an area where such taxes exist would have to include them.

An estimate of car operating costs must include a series of assumptions for tire and battery replacements, wheel alignments, light bulbs, fan belts, lubrications, brake linings, and other repair and maintenance items. The need for repairs can be estimated from discussions of repair experience with car service personnel, and from personal knowledge. They include such items as starter repair, carburetor overhaul, replacement of fuel pump, radiator hoses, muffler, tail pipes, and shock absorbers, and what must seem to an owner to be a pretty long list of other repairs. Several of these repairs must be made more than once during the life of the car. No costs need be included for repairs or replacements covered by warranties.

The assumed vehicle life of 100,000 miles during a 10-year period has been questioned by some persons who believe the time to be too long, and others who believe it to be too short. Vehilce survival data developed on the popular size, popular brand cars show that half of the autos were still on the road at the end of 10 years. This finding appears to be applicable to the compact cars also, but at this writing there is not enough evidence to establish a firm survival rate for the subcompacts.

In estimating the costs of owning and operating a car, it can be assumed that each car is bought new, without a trade-in. The intent is to trace each vehicle and its costs through a 10-year life as developed from odometer records of vehicles of these kinds. Usually a vehicle passes through two, three, or more owners during its life, but this is not included in ownership cost figures. Any owner would be unlikely to operate his only vehicle successively fewer miles each year until he drives only 5,700 miles in the tenth year, but a 9-year old car typically is operated fewer miles during the year than a new or relatively new car. Therefore it can be assumed that the older car becomes the second or third car in a family, or for some other reason it is operated at a much reduced rate.

Not all cost items can be listed in a table, but sufficient information should be included to assist those who wish to make recomputations to fit other geographic areas or other types of operation. For example, the running costs (gasoline, tires, oil, repairs and maintenance, etc.) for the vehicles in rural operation tend to be lower than for comparable cars in suburban use. This is not unusual since travel is less restricted in the "country." There are fewer traffic control devices to slow or stop vehicles, there is less vehicle congestion, and the opportunity for accidents with other vehicles is less frequent.

Automobile financing charges should be included in the costs shown in any report. Even if an automobile owner buys his car outright, he is foregoing the opportunity to earn interest on the money used for purchase. Complete cost accounting would require that financing costs or an interest lost charge be included as a part of the automobile costs.

Any arrangements made for off-street storage of a car at the owner's residence is considered to be his garaging cost. It may be an attached or detached garage, a carport, or it may be a paved or gravel surfaced space beside the house. Parking costs include metered curb parking and costs of temporary storage in lots or parking buildings away from the owner's residence.

In some areas of the United States tolls and garaging would cost less than in others, but an automobile owner traveling south, or west, or north from Baltimore, for example, customarily would encounter major toll routes. Also, he should spend more for garaging and parking than residents of small towns or rural areas. To go to New York City, 185 miles to the north and return, he would pay $7.90 in tolls. Since many rural area vehicle owners are located within the same toll complex, the toll charges shown for them would be somewhat higher than would be experienced by rural residents who do not have high speed toll facilities available to them.

Oddly enough, many automobile owners do not seem to be aware of many of their automobile costs. It is only when a motorist spends a fairly substantial amount for tire replacement, or for major mechanical repairs that he shows much concern about car expense. Otherwise he drives his vehicle and seems to conclude that his trips are costing very little. The average automobile is sold or traded three or more times during its life, usually through dealers. It is the need for repairs that causes many owners to "trade their cars in," and the dealers serve as quality control judges on the used vehicles. They wholesale the ones that require too much attention, and make the repairs on the remainder prior to resale. But whether the automobile is owned by an individual or is being repaired by a dealer for resale, the money is spent and eventually becomes part of the cost of owning and operating the car. Battery and tire replacements, brake linings, and numerous other replacements and repairs are included in the used car reconditioning programs of many dealers. The additional work that is done under dealer warranties does not impose direct out-of-pocket expenses on the car owner. The costs are submerged in each automobile's purchase price, and no effort needs to be made to separate them.

Numerous factors such as individual driving habits, climate, garage facilities, type of road used, purpose for which the car is used, and plain luck can affect the service life and costs of operating a car. As previously stated, the standard size car appears to have an average life of about 10 years, and the compacts appear to be surviving at very nearly the same rate. The current American subcompacts have been on the market about five years, so there is no complete survival history data on them. However, an odometer check of a limited sample of these subcompacts shows that their first year mileage is above 14,000 miles. Other vehicles that are generally of this size (the early Falcons, Valiants, Corvairs, and Ramblers, as well as many imports) appear to be present on the highways in sufficient numbers to warrant the following assumptions. For ease of comparison among vehicle sizes and uses, all study vehicles can be assumed to have a 10 year, 100,000 mile life. It also can be assumed that a normal travel pattern would be 14,500 miles in the first year, and a decreasing number of miles each year thereafter until the vehicle is driven only 5,700 miles in its tenth year. These assumptions are reasonably consistent with available travel data. The first year depreciation is fairly high. The comparable depreciation cost is lower each succeeding year, but the insurance, registration fees, and some of the other fixed charges do not decrease in proportion to the reduction in the amount a car is driven. The result is that these fixed, or relatively inflexible charges, cost more per mile, and tend to cancel a part of the reduction in other costs. Another factor that helps dampen the reduction in depreciation cost is the increase in maintenance and repair costs as the automobile becomes older.

The "annual trader" always has a new car but pays the first year depreciation over the 10 years. The "two-year trader" pays five times the depreciation for the first two years. This is a substantial savings from the annual trader's costs, and it appears that he can save even more by becoming a "three-year trader." However, after the first year he faces a series of outlays for tire replacement, repairs, and incidentals that begin to offset his savings in depreciation.

When an automobile is operated 100,000 miles, there are 400,000 miles of tire wear. It can be assumed that the automobiles would each wear out the original 5 tires and require 11 additional replacements, which would include 7 regular tires and 4 snow tires. If the automobiles are driven with reasonable care, and the wheels are kept properly aligned this number of tires should be adequate for the standard size car. The compact should turn 100,000 miles with usable tread left, and the subcompact should have approximately half the tread depth remaining on its final set of tires.

Depreciation is by far the greatest single cost of owning and operating an automobile, and in the great majority of cases, the age of the car is more important than its mileage in determining its resale or trade-in value. However, even though by far the greatest dollar depreciation in a car's value occurs in its first few years, the fact that newer cars are driven more miles tends to hold down the depreciation on a per-mile basis. For example, consider depreciation for the standard size car in this report. If the car were bought new for $4,379 and sold or traded at the end of the first year, when it had been driven 14,500 miles, depreciation would be $1,226. This depreciation cost divided by the 14,500 miles driven the first year amounts to 8.5 cents per mile. If the owner keeps his car two years, and sells or trades it for $2,253 when it has been driven 27,500 miles, depreciation would total $2,126, which divided by the 27,500 miles driven the first two years would be 7.7 cents per mile. Year by year, as the car gets older, depreciation decreases, but the outlay for maintenance and repair rises. As time passes it becomes increasingly difficult and expensive to keep a car in satisfactory operating condition.

The higher speeds possible on modern highways, and the opportunity to sustain those speeds on expressways and limited access routes such as the Interstate System, require well maintained, safe cars. Although added safety features are being incorporated in the highways and in new vehicles, there also must be a policy of continuous, high-standard maintenance of the vehicles to help make highway travel safe. A charge of $12.50 an hour or more for shop labor is not unusual, and this is a major factor in the cents-per-mile cost for repairs and maintenance for the standard size automobile. One of the claims for buying the compact cars and the subcompacts is the relative simplicity of the vehicles. "Do the minor repairs and replacements yourself," they say, but repair garage experience shows that the public generally is not ready to assume this responsibility. For those motorists who are willing and able to replace their own spark plugs, windshield wiper blades, fan belts, radiator hoses, etc., there are indeed savings to be realized, but when trained mechanics do these jobs, vehicle owners must pay professional wages.

When asked to name their single greatest outlay for automobile transportation, many people say that it is gasoline. This is not unusual, because so many stops are made at gasoline service stations. However, for the standard size car, records show that gasoline is the third highest cost, and the fourth highest for the compact and subcompact. In fact, during the past 30 years the price of gasoline has risen less, relatively, than many of the other costs associated with highway transportation. Gasoline is still one of the best bargains on today's market.

The automobile is continuously exposed to the possibility of damage whether it is on the highway or parked. The large numbers of vehicles on the roads, and the relatively uncontrolled traffic in shopping center parking lots make cars highly susceptible to accident involvement. Controlled crash tests show that vehicles produced in recent years are not able to escape unmarked from any sort of collision. Any automotive designs that appear to contribute unnecessarily to automotive damage will add to repair costs and insurance.

The quality of the roads — grades, surfaces, curves — has been improved substantially in recent years. The Interstate Highway System is more than three-quarters complete, and these roads are more than living up to the expectations for them. Highway authorities point out that the newer highways of the Interstate System design provide opportunity for greater speed and comfort to the motorist, with greater safety. Accident records show that the Interstate System accident rate is about half that of the remainder of the primary highways in the United States. Savings in accident costs from the Interstate System alone are counted in billions of dollars.

The development of local shopping centers, suburban residential areas, and employment centers, as well as the dispersal of recreational opportunities has made the automobile very important in the life pattern of many Americans. Sales records of new vehicles show that there is increased willingness to spend money for automatic transmissions, air conditioners, power steering and many other items of optional equipment. The lack of adequate roads can cause car running costs to rise. When traffic is not free flowing, there is greater fuel consumption, higher fuel cost, more pollutants are released into the air, there is greater opportunity for accidents, and there is much higher per-mile-wear on engine parts, brakes, tires, etc. So the problem is to maintain an adequate highway system that will provide safe, satisfactory transportation, and will save money on operating costs and maintenance costs. However, putting highway costs and taxes into proper perspective is difficult at times. Highway-user taxes are the major source of revenues for highway building and maintenance. So the motorist is, in a very real sense, paying for the roads that he is using. Taxes never have been popular, but the motorist should know that only 9.7 cents of the vehicle owning and operating dollar goes to pay for his roads.

The following format can be used to estimate operating costs over a 10-year life period. Portions of this format or others can be used if a shorter or abbreviated version is more desirable, provided that the form can accommodate the data.

STUDENT WORKSHEET
COMPUTING THE COST OF OPERATING AN AUTOMOBILE

Car_____Year_____Model_____Beginning Mileage_____Initial Cost Bases_____

(Total costs in dollars, costs per mile in cents)

ITEM	First Year (14,500 miles)		Second Year (13,000 miles)		Third Year (11,500 miles)		Fourth Year (10,000 miles)		Fifth Year (9,900 miles)	
	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE
Costs Excluding Taxes:										
Depreciation	---	---	---	---	---	---	---	---	---	---
Repairs and Maintenance	---	---	---	---	---	---	---	---	---	---
Replacement Tires	---	---	---	---	---	---	---	---	---	---
Accessories	---	---	---	---	---	---	---	---	---	---
Gasoline	---	---	---	---	---	---	---	---	---	---
Oil	---	---	---	---	---	---	---	---	---	---
Insurance	---	---	---	---	---	---	---	---	---	---
Garaging, Parking, Tolls, etc.	---	---	---	---	---	---	---	---	---	---
TOTAL	---	---	---	---	---	---	---	---	---	---
Taxes and Fees:										
State:										
Gasoline	---	---	---	---	---	---	---	---	---	---
Registration	---	---	---	---	---	---	---	---	---	---
Titling	---	---	---	---	---	---	---	---	---	---
Subtotal	---	---	---	---	---	---	---	---	---	---
Federal:										
Gasoline	---	---	---	---	---	---	---	---	---	---
Oil 2/	---	---	---	---	---	---	---	---	---	---
Tires	---	---	---	---	---	---	---	---	---	---
Subtotal	---	---	---	---	---	---	---	---	---	---
TOTAL TAXES	---	---	---	---	---	---	---	---	---	---
TOTAL OF ALL COSTS	----	----	----	----	----	----	----	----	----	----

COMPUTING THE COST OF OPERATING AN AUTOMOBILE (cont.)

Car_____Year_____Model_____Beginning Mileage_____Initial Cost Bases_____

(Total costs in dollars, costs per mile in cents)

	Sixth Year (9,900 miles)		Seventh Year (9,500 miles)		Eighth Year (8,500 miles)		Ninth Year (7,500 miles)		Tenth Year (5,700 miles)		TOTALS & AVERAGES FOR TEN YEARS	
	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE
Costs Excluding Taxes:												
Depreciation	---	---	---	---	---	---	---	---	---	---	---	---
Repairs and Maintenance	---	---	---	---	---	---	---	---	---	---	---	---
Accessories	---	---	---	---	---	---	---	---	---	---	---	---
Gasoline	---	---	---	---	---	---	---	---	---	---	---	---
Oil	---	---	---	---	---	---	---	---	---	---	---	---
Insurance	---	---	---	---	---	---	---	---	---	---	---	---
Garaging, Parking, Tolls, etc.	---	---	---	---	---	---	---	---	---	---	---	---
TOTAL	---	---	---	---	---	---	---	---	---	---	---	---
Taxes and Fees:												
State:												
Gasoline	---	---	---	---	---	---	---	---	---	---	---	---
Registration	---	---	---	---	---	---	---	---	---	---	---	---
Titling	---	---	---	---	---	---	---	---	---	---	---	---
Subtotal	---	---	---	---	---	---	---	---	---	---	---	---
Federal:												
Gasoline	---	---	---	---	---	---	---	---	---	---	---	---
Oil 2/	---	---	---	---	---	---	---	---	---	---	---	---
Tires	---	---	---	---	---	---	---	---	---	---	---	---
Subtotal	---	---	---	---	---	---	---	---	---	---	---	---
TOTAL TAXES	---	---	---	---	---	---	---	---	---	---	---	---
TOTAL OF ALL COSTS	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Implementation:

Students should work individually or in groups to establish both the history and the cost of operation of a specific automobile. It is recommended that case studies of cars of standard, compact and subcompact size be used by different students so that comparisons can be made between the three. It may also be of interest to students to compute costs related to the operation of sports cars, motor cycles, motor scooters, bicycles and other owned transportation systems, although realistically, automobile transporation is the primary mode of travel.

While new cars are the easiest example to use for computation purposes because of the reliability of the data, used transportation costs may also be realistically derived if repair costs are viewed realistically.

It may be helpful to have resource persons from new and used dealerships present either individually or in panels to the class using the standard form presented with this project lesson as a guide for the discussion. The form should be given to these individuals in advance so data for an actual car can be completed.

Resources:

Additional information can be obtained from:

Cost of Operating An Automobile, U.S. Department of Transportation, Federal Highway Administration, Office of High Planning, Highway Statistics Division. Order from Government Printing Office, Washington, D.C. 20402.

Car Buying Made Easier. Ford Motor Company.

Your Automobile Dollar. Household Finance Corporation, Prudential Plaza, Chicago, Illinois 60601.

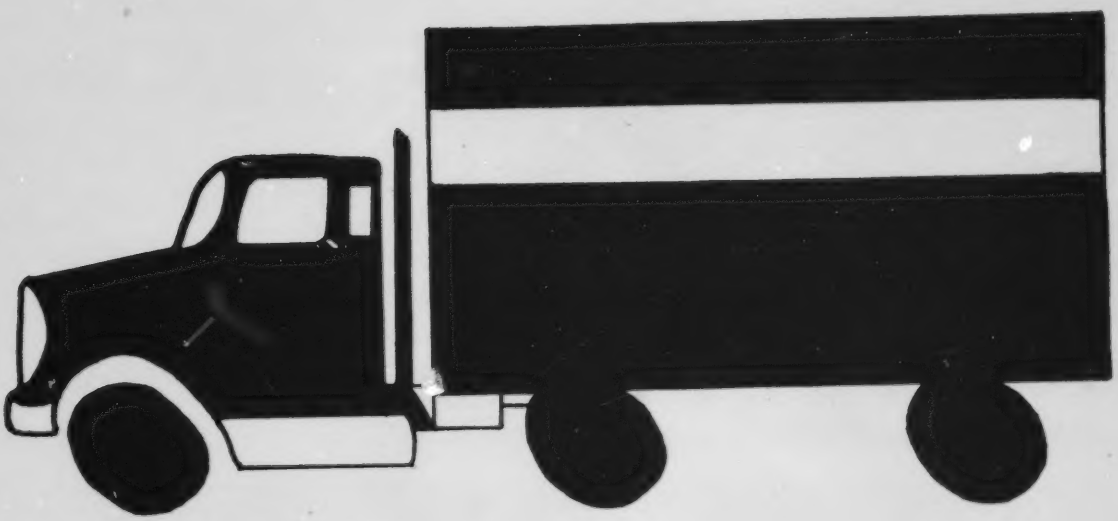
COMPUTING THE COST OF OPERATING A TRUCK

Objectives:

1. Lists factors associated with operation costs.
2. Interviews truck owner-operator.
3. Computes costs per mile of operation.
4. Compares operating costs of different trucks in class discussions.

Related Occupations:

Truck Driver	D.O.T. 905.883 D.O.T. 906.883
Tractor-Trailer Truck Driver	D.O.T. 904.883
Truck Foreman	D.O.T. 909.883



Information:

The trucking industry is large. More than ten million persons are employed in the manufacture, distribution, maintenance and commercial use of trucks. This is about 10 percent of the labor force. Over 21 million trucks haul 98 percent of the nations livestock, 65 percent of its fruits and vegetables and over half of the total weight of manufactured goods, petroleum and coal products into our cities. Trucks account for about 18 percent of the nation's 118 million motor vehicles.

Of the 7 million truck owners in this country, about 6.5 million are small entrepreneurs owning one or two trucks. Of these, more than one third work alone with no employees. This means that the business end of the enterprise falls directly on the owner-operator.

Each year, the trucking industry spends about 75 billion dollars for labor, new equipment, parts and accessories. This expenditure does not include license and fuel which are also a part of operating costs.

Truck drivers, foremen and particularly owner-operators, then, must be able to compute operating and routine maintenance costs associated with this commercial vehicle. The profit or loss on a truck for hire is frequently made at a desk keeping detailed records of operating costs. For example, operating costs are deductable as business costs from gross income when computing income taxes. The higher the operating costs, the less the net income upon which taxes must be paid. Detailed records, however, are necessary to verify expenditures.

Operating costs are both fixed and variable. Fixed costs include license, insurance and maintenance agreements which must be paid each year no matter how much the truck is driven. Variable costs include fuel, lubrication, cleaning, routine maintenance, tires and minor repairs which increase with the number of miles the truck is driven. Major repairs such as engine overhaul are usually depreciated over time and are not included with operating costs.

The object in computing operating costs is to find out how much it costs to operate a vehicle per mile over one year's time so that the value of this piece of commercial equipment to the business can be determined. These figures are also useful to compare the operating costs of different trucks used for similar purposes such as general delivery, moving or over the road hauling.

Implementation:

Each student who completes this exercise should select a specific truck or type of truck and an operator from whom accurate records can be obtained. Information about the truck, how it is used, and operating costs information can be obtained either from the business manager or from the driver's log book. The form following may be used by the student to compute operating costs.

Students should interview an owner-operator at his place of business. An alternative is to have a knowledgeable owner-operator come to the class as a resource person. Still another alternative is to have students interview truckers at a nearby truck stop or expressway interchange. Dealers can also be consulted and invited to the class to discuss operating costs of competitive commercial trucks. Resources below should also be consulted.

Truck Identification_____GVW_____

_____

Primary Use_____

Miles driven per year_____

Fixed Costs: License_____Insurance_____

Maintenance Agreements_____

Other_____ _____ _____

Variable Costs: Fuel_____Lubrication_____

Minor Repairs_____Tires_____

Other_____ _____ _____

Total Costs_____Total Miles_____

Operating Cost per mile_____

Resources:

American Trucking Association, Inc., 1616 P St. N.W., Washington, D.C. 20036.

Bailey Films Association, 11559 Sana Monica Boulevard, Los Angeles, CA 90025.

International Brotherhood of Teamsters, 25 Louisiana Avenue N.W., Washington, D.C. 20001.

STUDENT WORKSHEET

COMPUTING THE COST OF OPERATING A TRUCK

Instructions:

Interview an owner or owner-operator of a commercial truck. Compute operating costs from information obtained from driver's log book and maintenance records.

Truck Identification _____ GVW _____

Primary Use _____

Trips made per day _____ Per Week _____

Origin and destination of trip _____

Miles Driven per trip _____ Per Week _____

Miles Driven per year _____

Fixed Costs: License _____ Insurance _____

Maintenance Agreements _____

Time Payments _____

Other _____

Variable Costs: Fuel _____ Lubrication _____

Minor Repairs _____ Tires _____

Other _____ _____ _____ _____

Total Costs _____ Total Miles _____

Operating Cost per Mile _____

Owner Reactions:

What are the personal satisfactions and rewards of owning and operating your own truck?

What are the disadvantages of owning and operating a truck?

Would you recommend driving, owning and operating a truck as a career choice? Why or why not?

PERFORMING ROUTINE AUTOMOTIVE

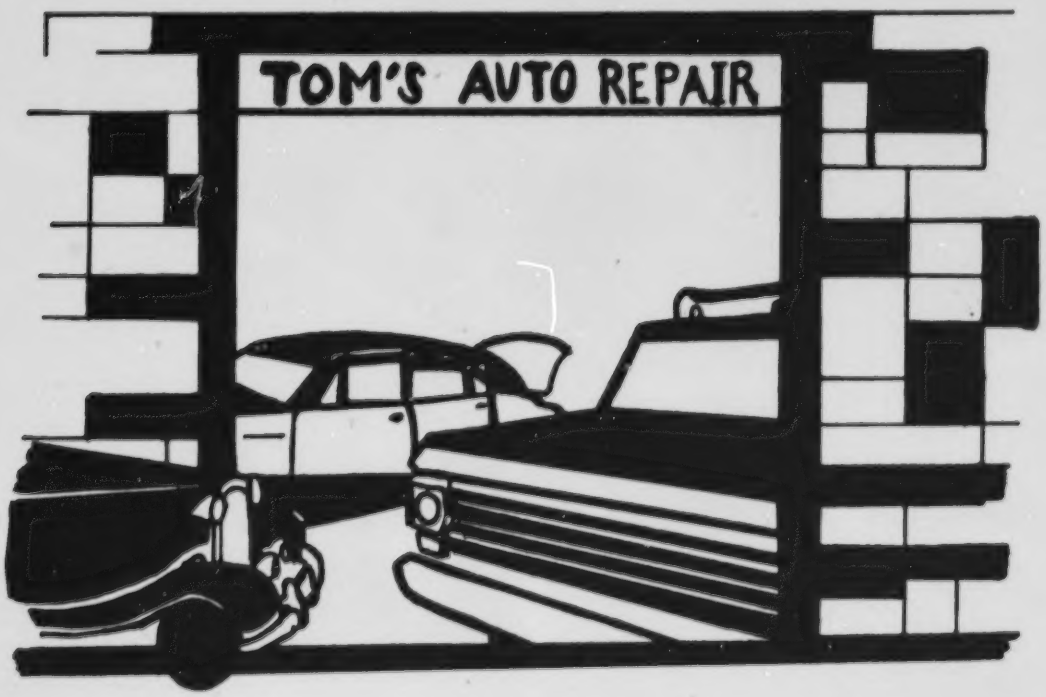
TRANSPORTATION MAINTENANCE

Objectives:

1. Explains several routine automotive maintenance tasks.
2. Records procedure for performing one or more routine tasks.
3. Performs procedure for specified tasks under supervision of trained mechanic.
4. Lists routine maintenance tasks for a specific make, model and year auto noting specifications, capacities, part numbers and associated costs.

Related Occupations:

Automobile Mechanic	D.O.T. 620.281
Truck Mechanic	D.O.T. 620.281
Service Engineer	D.O.T. 620.281
Shop Mechanic	D.O.T. 620.281



Information:

Routine automotive maintenance is performed on cars and trucks by trained mechanics at garages and service stations. The same is true for all transportation systems which require periodic lubrication, adjustment and replacement of minor parts to insure trouble-free operation for the life of the equipment. There are approximately three quarters of a million skilled auto-mechanics in the labor force who work at dealerships, independent repair shops and service stations, not to mention those who work for federal, state and local governments, taxicabs and automobile leasing companies.

Routine automotive maintenance tasks include:

1. Checking fluid levels
2. Checking belts, hoses, water pump and windshield wipers
3. Checking tire pressures
4. Checking lights
5. Cleaning the finish of the car
6. Changing the coolant
7. Cleaning the engine compartment and chassis
8. Lubrication
9. Changing spark plugs.

Minor engine tune-up is usually not included with routine maintenance because special tools, skills, and electrical instruments are needed to make final adjustments to the engine, transmission and charging system.

While routine maintenance tasks are performed by skilled mechanics in the service shops, Americans in increased numbers are working on their own cars at the suggestion of many auto manufacturers to reduce operating costs and increase their personal independence in a technical society. In fact, many of the younger generation have taken up mechanics as an avocation for personal fulfillment.

1. Checking fluid levels is the most routine of automotive maintenance tasks. These include the a) brake fluid, b) battery electrolyte level, c) windshield washer fluid, d) radiator, e) oil level in the crankcase, f) the transmission fluid level, g) power steering fluid, and h) differential grease level. Cautions must be observed with each of these. They are as follows:

a) Brake fluid level: The engine should be stopped. Remove the cover of the master cylinder. The oil level should be to the indicated mark. Care should be exercised not to overfill the cylinder, and to keep dirt from entering the system. Be sure the fluid used is exactly right for the brake system. Read the specifications on the can. The wrong fluid can damage the brake system.

b) Battery electrolyte level: This is checked with the engine stopped. Safety goggles should be worn. The acid in the battery will burn the skin and eyes. Caution should be exercised. A water source should be available should acid spill on the hands from the caps when they are removed. Fill the battery with distilled water only to the level indicated. An overfilled battery will run over when charging and acid will remove the paint and corrode the vehicle.

c) Windshield washer fluid level: This is checked with the engine stopped. Fluid of the specified type is added using a small necked container or a funnel. Care should be exercised not to allow the fluid to enter the eyes.

d) Radiator coolant level: This is checked with the engine stopped and cold. Do not remove the radiator cap of a hot radiator. It can cause hot coolant to be expelled from the system and the person removing the cap to become scalded. Safety glasses should be worn.

e) Oil level: Check with the engine hot and stopped. The level should be as specified on the dip stick. Care should be exercised not to burn the hands.

f) Transmission fluid level: The engine should be hot and the transmission placed in park. The engine and oil are hot. Care should be exercised not to burn the hands. Care should also be exercised not to overfill the transmission which could cause foaming of the fluid and damage to the transmission.

g) Power steering fluid level: This is checked hot and with the engine running. Care must be exercised not to overfill. The fluid expands when hot, and will cause the reservoir to overflow if too much fluid is added. Extreme caution must be exercised to keep hands away from the fan belts. Do not use a rag in the vacinity of the power steering unit. It can become entangled and pull hands into the fan belt and blades.

h) Differential fluid level: This is checked hot. Care must be exercised that the car does not fall. Stand jacks or safety blocks should be used. Never trust a jack or hoist of any kind. Remove the plug located about one-third up from the bottom of the differential. Fluid should begin to flow from the hole or be touchable with a clean finger inserted through the hole. If not, fluid is added until it runs from the hole.

2. With the engine off, belts, hoses, water pump and windshield wipers are checked seasonally to insure that they have not deteriorated from wear, heat aging or cracking. Belts are inspected for cracks, cuts and places where the fiber has become frayed. Most belts should be dead tight, but not overtightened. If belts still slip, such as when the power steering causes a noise, they should be replaced. Avoid overtightening since this overloads bearings on accessories such as the alternator. Hoses heat, age, crack, become brittle and then rupture. They are changed when they begin to lose their pliability and tend to become stiff. If screw hose clamps are used, they should be tightened, but not overtightened. Be sure to inspect heater hoses while under the hood. These sometimes are overlooked and fail when least expected. Water pumps have a life of from 35,000 to 70,000 miles over a three or four year period. Failure is often indicated by a noise at the fan and loss of coolant. To check the water pump, try the fan for wobble or end play. Most water pumps will have some, but not much. Check it periodically so as it becomes progressively worse, it can be changed before it fails. Also note if it is making noise at the shaft bearing. If it has more than 1/8" play at the end of the blade and is making noise, there is a good chance that its failure is imminent. Have it checked at a garage. Windshield wipers can be checked by operating them on a wet windshield and watching for places where they do not wipe clean. Visual inspection will also reveal if the blade has lost its life or has become cracked, nicked or torn at the edge. Directions for replacement is on the box which contains the new blades should replacement be necessary.

3. Tire pressures are easily checked with a gauge which costs about a dollar. Pressures specified by the manufacturer range between 20 and 30 pounds per square inch. Tires should be checked warm and set exactly as specified.

4. Lights are easily checked. With the parking brake set, start with the parking lights. Walk around the car and observe that each light is lit. Turn on the head lights, try both bright and dim with the dimmer switch. Turn on the key and try the signal lights. Next, try the flasher system. Finally, if the vehicle is so equipped, try the under hood and trunk lights.

5. Cleaning the finish of the car is important. It protects the investment. A number of cleaners are available to make the job easier, among them; car wash soap, white wall cleaner, tar remover, and of course several polishes. After cleaning, look over the finish for signs of chipping paint and rust, these should be repaired with a touch-up kit available from most automotive jobbers or dealerships. If you are in doubt about the condition of the finish, consult a body shop. He can tell if the surface paint is chipped, or if rust is behind and additional work is needed to restore the body to good condition.

6. The coolant is changed seasonally if it becomes contaminated or diluted with use. All weather coolant is checked periodically to see that it is clean, and that it will prevent winter freezing at the temperature specified for a particular region. Don't remove a radiator cap with the car running or hot. It could result in scalding. If the coolant is to be changed, open the drain cock at the bottom of the radiator and catch the liquid in a drain pan. A pair of pliers will be needed to open the cock but care should be exercised not to damage it by overtightening. The direction of rotation can easily be noted by looking at the threads on the cock to see which way the valve must turn to open. After draining the fluid, close the cock and add the amount of new coolant that was removed to fill the radiator. The engine may have to be started to remove air from the system. Care should be exercised not to drop a funnel or other instruments into the fan when the engine is running. Safety goggles should be worn.

7. Cleaning the engine compartment and chassis of grease and dirt can be done with a solvent which is washed off after soaking, or be done with a pressure hose at the local car wash. A combination of both may be necessary if the condition is particularly severe. Goggles must be worn to protect the eyes. It will also be necessary to cover the carburetor with a rag if the air cleaner is removed to keep water from entering the engine. Additional dry rags will be necessary to dry the ignition wiring and the inside of the distributor cap if the car fails to start afterward because of moisture.

8. Lubrication consists of changing the oil, greasing lubrication fittings, oil filter replacement, and changing the air and fuel filters if they show signs of becoming clogged with contaminants. The engine is drained hot to insure the oil will flow from the crankcase into a drain pan by removing the drain plug in the base pan. Draining the oil takes about 10 minutes. The car must be raised enough to permit loosening the drain plug. Care must be exercised to replace the drain plug free of dirt straight into the threads. This is accomplished by running the plug in at least five threads by hand before a wrench is used. Care must also be exercised that the plug is not overtightened. Usually a two finger pull on an eight inch wrench is sufficient. The filter is loosened and replaced at the same time the oil is draining to speed the task. After cleaning the surface at the filter base, the replacement element is screwed on until it contacts the surface firmly, and then tightened three quarters of a turn. After the oil is drained, the plug is replaced and tightened, and the oil filter is replaced, oil in the amount specified for the engine is added through the filler cap, Check for leaks by running the car at a fast idle and watching for oil drips. To replace the air cleaner element, remove the air cleaner cover. The element can be held up

to a light to see if it is sufficiently dirty to warrant replacement. Care must be exercised not to overtighten the air cleaner cover or it will damage the carburetor. The gasoline filter is changed about every 10,000 miles to 20,000 miles. Since inspection is difficult, it is recommended that this element be changed when the time arrives, irrespective of its condition. Its replacement is money well spent to protect the internal parts of the fuel pump and carburetor.

9. Spark plugs are changed about every 10,000 to 15,000 miles, depending upon how the car was driven, and the condition of the engine. It is a simple task, but several cautions must be exercised. Use the correct tools, a plug wrench. If the engine is hot, wear gloves to prevent burning the hands. Remove the spark plug wires by pulling only at the insulator on the plug or damage to the wires will result. Loosen each plug one turn and then blow around the plug with air to remove dirt. Goggles must be worn. Remove the plugs and inspect each one. If a plug is drastically different than others in color, or oil soaked at the spark tip, tag it with the number of the cylinder for later reference. New plugs should be gapped with a wire gauge between .025 and .045 thousandths of an inch, depending upon the specification for the engine. A wire gapping gauge costs about 50 cents. Care should be exercised not to put pressure on the center electrode when changing the sparking gap or damage to the procelain will result. Lay the plugs out and install the washers over the threads. This is necessary to be sure the plug is turned into the threads straight before tightening with a wrench. Failure to do this may result in a plug being turned with a wrench crossthreaded, requiring that the plug be discarded, and that the thread in the head be re-tapped. This could be serious. After all plugs are snug, tighten each one carefully. If a torque wrench is not available, about three fingers force on the end of a 10 inch handle is sufficient. For plugs that have a tapered sealing surface, the plug should be about twice as tight as one which uses a sealing washer. Care must be exercised, however, not to break the procelain when tightening a plug. This ruins it. Another word about tightening: If a plug is too tight, it changes the sparking gap setting and strains the threads, if it is too loose, the plug lets gas escape, damages the threads, and runs hotter than the heat range specified. This results in shortened plug life and inefficient operation. Replace the plug wires, wipe each plug area clean, and start the engine to check its operation.

Implementation:

Each student should pick one or more of the maintenance tasks to complete as a project. An alternative is to have several students complete all maintenance tasks as a group project. If the teacher has limited experience in this area, a demonstration of each of the maintenance tasks should be given by a competent mechanic. This could occur at school or in one of the local businesses. It is important that students not stumble through the tasks, thinking any way is correct. There is a correct way to complete the tasks, and once each student has seen a competent mechanic perform the tasks, almost anyone can learn to do the same if practice is performed under the watchful eye of one who knows.

Resources:

A number of resources are available to teach the several maintenance tasks outlined. Resources are available in the form of sound films, film strips, wall charts, booklets and manuals. A s source which is helpful in locating the right material for each of the tasks is a booklet titled:

Automotive Instructional Material, Automotive Service Industry Association, 168 North Michigan Avenue, Chicago, IL 60601.

Films are also available from Free Films Guide available in most libraries, and from the film libraries of General Motors and the Ford Motor Company.

STUDENT WORKSHEET

PERFORMING ROUTINE AUTOMOTIVE TRANSPORTATION MAINTENANCE

Instructions:
Choose three of the autmobile maintenance tasks to complete. If you have limited experience in this area, arrange to observe a competent mechanic perform three of the tasks and complete the check list accordingly. Observations could be made in the school's automotive class or in a local business.

ROUTINE AUTOMOTIVE TASKS

1. Check fluid levels:

a. Check brake fluid level:

Stop Engine _____
Remove cover from master cylinder _____
Fluid should reach indicated level _____
Read specifications on the brake fluid can _____
Brake fluid should be exactly right for the system _____
Fill to indicated level if required _____
SAFETY Do not overfill _____
CAUTION Keep dirt from entering system _____
Replace master cylinder cover _____

b. Check battery electrolyte level:

Stop engine _____
SAFETY Wear safety goggles _____
SAFETY Have wash water available in case batter acid spills _____
Remove battery caps _____
Fill with distilled water to indicated levels _____
CAUTION Do not Overfill _____

c. Check windshield washer level

Stop engine _____
CAUTION Fill with specified fluid _____

d. Check radiator coolant level

Wear safety goggles _____
Check with stopped, cold engine _____
SAFETY Do not remove cap from hot engine _____
Remove radiator cap from cold engine radiator _____
Fill with water _____
Replace cap _____

e. Check oil level

Check in hot, stopped engine _____
Remove dip stick _____
Wipe, replace, and remove dip stick _____
Oil should reach indicated level _____
CAUTION Fill with specified oil _____

f. Check transmission fluid level

Engine and oil are hot _____
Transmission is place in park _____
Fill to indicated level _____
CAUTION Do not overfill _____

g. Check power steering fluid

Engine is hot and running _____
Fill to indicated level _____
CAUTION Do not overfill _____
SAFETY Use extreme caution around fan and belts _____

h. Check differential fluid level

Engine is hot _____
Jack or hoist car _____
SAFETY Stand jacks or safety blocks used _____
Remove differential plug _____
Fluid should flow from hole _____
Fill with specified fluid until it flows from hole _____
Replace plug _____

2. Check belts, hoses, water pump and windshield wipers

a. Belts

Check for cracks, cuts, and frayed fiber _____
Check to see that all belts are dead tight _____
Replace slipping belts _____
CAUTION Do not overtighten belts _____

b. Hoses

Check hoses for loss of pliability and brittleness _____
Check and tighten hose clamps _____

c. Water pump

Check the fan for wobble or play _____
Listen for shaft bearing noise _____

d. Windshield wipers

Operate wipers on wet windshield _____
Check for loss of effectiveness _____
Visually check for cracks, nicks, or tears _____

3. Check tire pressures

   a. Use a tire gauge _____
   b. Place gauge squarely on tire valve _____
   c. Check all four tires for specified pressure:
      1. _____psi 2. _____psi 3. _____psi 4. _____psi

4. Check parking lights

   a. Parking lights _____
   b. Head lights _____ Bright _____ Dim _____
   c. Signal lights _____ Left _____ Right _____
   d. Flasher system _____
   e. Hood Lights _____
   f. Trunk lights _____

5. Check and clean the finish of the car

   a. Wash the car _____
   b. Check the body for chipping paint or rust _____
   c. Location _____

6. Check and change the coolant

   a. Check coolant for cleanliness _____
   b. Add coolant if needed _____

7. Clean engine compartment and chassis

SAFETY a. Wear safety goggles _____
   b. Soften grease and dirt with a solvent
   c. Wash with pressure hose _____
CAUTION d. Keep water from entering engine _____
   e. Dry wiring _____

8. Lubrication

   a. Change oil _____
   b. Grease lubrication fittings _____
   c. Replace oil filter _____
   d. Change air filter _____
   e. Change gasoline filter _____

9. Check and change spark plugs

   a. Remove old plugs _____
   b. Gap new plugs _____
   c. Replace plugs in engine _____

CLEANING AND GAPPING A SPARK PLUG

Objectives:

1. Recognizes specific plugs and their application from specification charts.
2. Inspects plugs for specific malfunctions.
3. Cleans and gaps one or more spark plugs.
4. Tests a spark plug under pressure.

Related Occupations:

Spark Plug Assembler	D.O.T. 729.884
Engine Repair Serviceman	D.O.T. 625.281
Tune-Up Man	D.O.T. 620.281

Information:

Spark plugs are used in gasoline and liquid propane engines. This includes nearly all automobile and small truck engines, motor cycle engines, motor boat engines, lawn mower engines, tow and fork lift engines, tractor engines, chain saw engines and many others. When these engines are "tuned-up," the spark plugs are removed, inspected, cleaned or replaced, gapped and then reinstalled. Typically, there is one spark plug for each engine cylinder.

The spark plug functions to ignite the explosive gasoline-air mixture, brought under pressure by the action of the piston which reduces its volume in the end of the cylinder. The result is an explosive "bang" which expands the gas and forces the piston to move in the cylinder and drive the engine crankshaft. The spark plug is located in the end of the cylinder and timed to emit a spark between two electrodes so that it ignites the mixture just when the piston brings the mixture under its highest pressure. If the plug fails to "fire", the cylinder "misses" and the engine loses power. Engines that sputter and miss commonly need the spark plugs cleaned or replaced, depending upon their condition.

Spark plugs are constructed from three main parts: 1) the shell, 2) the center electrode, and 3) the procelain insulator. The shell is the threaded metallic body which serves to secure the plug in the engine. At the threaded end it contains the bendable tab-like electrode which can be adjusted. The opposite end has a crimped edge which is so formed to seal the procelain electrode in the metallic body and give the plug structural integrity. The center electrode is insulated from the body and carries the high voltage spark through the center of the spark plug so that it can bridge the gap to the negative electrode tab. It consists of a soft metallic core about the size of a large pencil lead. During use, the end of the center electrode is eroded by the action of the high voltage spark which occurs at the spark plug gap between the center electrode and the bendable tab. The procelain insulator separates the electrode from the threaded metallic body and acts to impede the spark from jumping from the center electrode to the metallic body, except at the spark plug gap. It is important that the insulator remain clean and free of cracks since the high tension spark of 20,000 volts would escape to ground by another route.

Spark plugs are referred to as "hot" or "cold" running, depending on their heat range specification. Plugs with higher numbers run hotter than plugs with lower numbers. The operating temperature at the tip of the center electrode frequently reaches in excess of 1000° F caused by the heat of combustion. Heat is dissipated from the electrode through the insulator to the metallic body and then to the engine head. The length of the insulator inside

the plug body determines how far the heat has to travel to be dissipated and thus the heat range of the plug. Plugs with long insulators inside the metallic body run hot. Those with shorter insulators inside the body run cooler. How a spark plug of a specific temperature is operating can be determined by looking at the plug when it is removed from the engine. If the plug is light, then the plug is operating properly and burning away harmful carbon deposits. If the plug is running black and sooty, chances are it is running too cool and will eventually foul and misfire. There is also the inevitability that as the engine wears, more oil will enter the combusion chamber causing this condition, even though the plug has been correctly specified. Regardless, if the plug is running black, and the engine is tuned to its best, it should be changed for one which will run hotter to keep it clear and free from harmful deposits. It is also true that if the plug is running chalky white, chances are it is running too hot. Plugs that run hot will deteriorate under the severe heat conditions and not last as long as expected.

To clean a spark plug it must be removed, cleaned outside, sand blasted, filed square between the electrode and the bendable tab, gapped, pressure tested and then reinstalled in the engine. The following procedure is recommended:

CLEANING A SPARK PLUG

1. Record the correct specification for the plug:

   Make_____Number_____Gap_____

2. Loosen the plug with a spark plug socket: Ok_____

3. Blow loose dirt from around the plug with an air hose: Ok_____

4. Remove the plug from the engine and inspect it:

   Gap_____Color_____Hot_____Cold_____Fouled_____

5. Wipe the insulator clean with a rag and inspect it for cracks:

   Replace_____ Ok_____

6. Clean the threads with a wire brush: Ok_____

7. Clean the inside of the plug in a sand blasting machine:

   Ok_____

8. Open the gap slightly and file the electrode square with a special plug file:

   Ok_____

9. File the bendable tab flat in the inside: Ok_____

10. Set the gap with a wire gapping tool by bending the tab:/

    Ok_____

11. Test the firing capability of the plug under pressure in the spark plug tester:

    Pressure_____Misfires_____Ok_____

12. If the plug is good, reinstall by hand in the engine: Ok_____

13. Tighten the plug with a torque wrench to the correct specification:

    Specification_____ft. lbs. Ok_____

Signed_____

Implementation:

Each student should clean and gap several spark plugs. They are available from a number of sources, including filling stations, salvage yards, auto repair shops and parts stores. They can also be taken from the family lawn mower, implements, tractors, automobiles and motor cycles and then reinstalled after the operation is performed. Special tools required include: 1) plug socket, 2) air gun, 3) wire brush, 4) spark plug cleaner, 5) plug file, 6) gapping tool, and 7) torque wrench. The tool layout can be put on a workbench and after a demonstration, almost anyone can be expected to perform the operation satisfactorily the first or second time.

As an alternative, a technical representative from one of the major spark plug manufacturers such as Champion or AC can be invited to come to the school for a demonstration. These resource persons can be contacted through local parts suppliers, and bring with them a variety of demonstration equipment including oscilloscopes, simulators, large cutaway models and audiovisual media equipment and software.

Resources:

Automotive Instructional Material, Automotive Service Industrial Association, 168 North Michigan Avenue, Chicago, IL 60601.

STUDENT WORKSHEET

CLEANING AND GAPPING A SPARK PLUG

Instructions:

Collect three or more used spark plugs from the following sources: filling stations, salvage yards, auto repair shops, parts stores, family lawn mower, implements, tractors, automobiles, or motorcycles. Special tools will be supplied in the classroom or laboratory. After a demonstration of the propoer procedure, proceed with cleaning and gapping spark plugs on your own.

Identify and define use of each:

1. Plug socket
2. Air gun
3. Wire brush
4. Spark plug cleaner
5. Plug file
6. Gapping tool
7. Torque wrench

Clean a Spark Plug:

1. Record the correct specification for the plug:

   Make _____ Number _____ Gap _____

2. Loosen the plug with a spark plug socket: _____
3. Blow loose dirt from around the plug with an air hose: _____
4. Remove the plug from the engine and inspect it:

   Gap _____in. Color _____ Hot _____ Cold _____ Fouled _____

5. Wipe the insulator clean with a rag and inspect it for cracks:

   Replace _____ OK _____

6. Clean the thread with a wire brush: _____
7. Clean the inside of the plug in a sand blasting machine: _____

8. Open the gap slightly and file the electrode square with a special plug file: _____
9. File the bendable tab flat on the inside: _____
10. Set the gap with a wire gapping tool by bending the tab: _____
11. Test the firing capability of the plug under pressure in the spark plug tester: _____
12. If the plug is good, reinstall by hand in the engine: _____
13. Tighten the plug with a torque wrench to the correct specification: Specification _____ft. lbs. OK _____

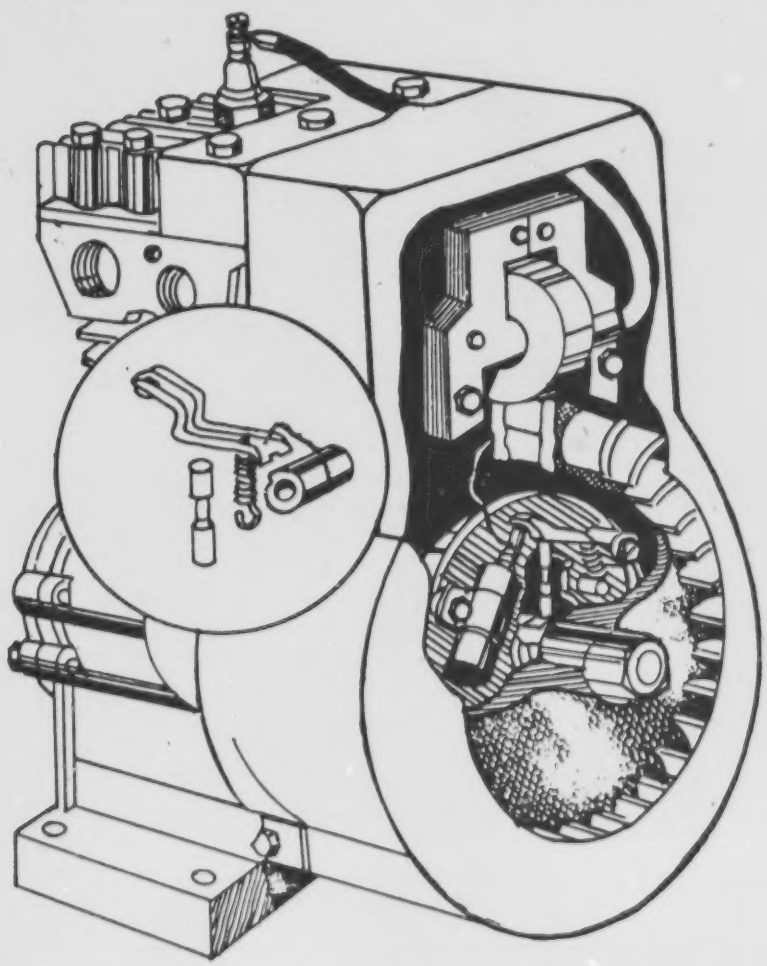
TUNING A FOUR-STROKE CYCLE ENGINE

Objectives:

1. Identifies specific engines by make and model.
2. Cleans engine in a professional manner
3. Performs systems inspection, repair and adjustment procedures.

Related Occupations:

Mechanical Test Technician	D.O.T. 869.281
Motorcycle Mechanic	D,O.T. 620.281
Small Engine Mechanic	D.O.T. 620.281
Automobile Mechanic	D.O.T. 620.281
Marine Engine Mechanic	D.O.T. 620.281
Mechanical Maintenance Man	D.O.T. 620.281



Information:

A tune-up procedure involves three basic steps:

1. Inspection of systems components
2. Repair of systems components
3. Adjustment of systems components

Four systems are usually inspected, repaired and then adjusted when tuning-up a 4-stroke cycle internal combustion engine:

1. Engine mechanical system
2. Ignition system
3. Carburetion system
4. Air vane governor system

There are several components in each of these systems. In the mechanical system, the two most important operational characteristics to observe are loss of compression and engine mechanical noises. Usually the only repairs performed during a tune-up to the mechanism of the engine are tightening the cylinder head and other engine bolts, and in some instances, replacing a leaking head gasket. No mechanical engine adjustments are performed during a periodic tune-up, except in commercial grade engines which are sometimes equipped with valve tappet clearance adjustments. If the engine is so equipped, the valve tappet clearance should be checked and adjusted if necessary.

Components of the ignition system include the flywheel, key and magnets; the ignition switch, primary wires, breaker points and condenser; and the high tension wire. Each of these components should be inspected for wear, damage and performance during testing. Parts which regularly need to be replaced or repaired are the breaker points, condenser, and sometimes the flywheel key, primary and secondary wires. The ignition breaker points are adjusted.

Components of the carburetion system include the fuel, tank filter and lines, high speed and low speed carburetor circuits, air cleaner, throttle linkage and cable. Inspection is make of the fuel, gas tank, fuel filter, gas lines, float bowl, the connection where the carburetor is bolted to the engine, and the throttle linkage and cable. Repairs include installing fresh gasoline, cleaning the fuel tank and filters, tightening the carburetor float

bowl screws, tightening the bolts where the carburetor joins the engine, and cleaning and lubricating the throttle linkage and cable. In some instances the carburetor will be removed, disassembled and repaired to complete the tune-up. Adjustments are made running to the high speed and low speed jets, throttle linkage and to the air vane governor.

Components of the air vane governor include the throttle and governor linkage, governor spring and air vane. Each of these parts is inspected for wear and damage. Repairs are made by replacing such parts as the air vane and governor spring if it is broken or stretched.

The tune-up sequence recommended is as follows:

TUNE-UP SEQUENCE PROCEDURE

1. Engine specifications:

   Make_____ Model_____

   Head Torque_____ lb.ft.

   Flying Torque_____ lb.ft.

   Case bolts_____ lb.ft.

   Point gap_____ Plug gap_____

   Valve clearance_____

   High Speed_____ rpm Low speed_____ rpm

2. Clean the engine:

   Solvent_____ Pressure wash_____ Ok_____

3. Check the crankcase oil level:

   Changed_____ Added_____ Ok_____

4. Check the fuel level:

   Changed_____ Added_____ Ok_____

5. Start the engine and cycle from start to high speed and back to idle to check running operation:

   Comment_____

6. With the engine running, check for noises:

   Rod noise_____ Valve noise_____ Ok_____

7. Torque head bolts and crank case bolts:

   Torqued_____ Ok_____

8. Ground spark plug wire and check cranking compression:

   Low_____ Ok_____

9. Clean and gap or replace spark plug:

   Cleaned_____ Replaced_____ Ok_____

10. Remove and replace the flywheel to inspect, test, repair and adjust the following:

Flywheel key:	Replaced_____	Ok_____
Breaker points (gap):	Replaced_____	Ok_____
Condenser (test):	Replaced_____	Ok_____
Primary wire and switch:	Replaced_____	Ok_____
Ignition coil (test):	Replaced_____	Ok_____
Coil secondary wire:	Replaced_____	Ok_____
Torque flywheel nut:	Torque_____lb.ft.0	_____
Armature air gap:	Set_____	Ok_____
Recoil starter and rope:	Replaced_____	Ok_____

11. Check the ignition spark:

Weak_____ Ok_____

12. With the engine running and warm, adjust the carburetor and air vane governor:

High speed jet (under load):	Adjusted_____	Ok_____
Low speed jet (idle no load):	Adjusted_____	Ok_____
Throttle valve (idle no load):	Adjusted_____	Ok_____
Ignition primary switch:	Adjusted_____	Ok_____
Air vane governor (no load):	Adjusted_____	Ok_____

13. Cycle the engine from start to high speed and back to idle to check running operation:

Readjusted_____ Ok_____

Signed_____

Implementation:

Students should work in groups to complete this project. Horizontal shaft engines are available from a number of places, including lawn and garden implement dealers, nurseries and from the homes of interested parents.

While a small engine tool kit is not absolutely necessary, it is desirable. Safety glasses are a must. Tools should include a torque wrench and sockets, flywheel holder and wrench, feeler gauge, plug gapping tool, engine cleaning solvent, gasoline and oil, screwdriver and tachometer.

An alternative to group projects is to have a trained mechanic from a dealership give a demonstration either at the school or at his place of business.

Resources:

General Theories of Operation, Briggs and Stratton Corporation, Form MS 3553-24.

Small Gasoline Engines Training Manual, by Ted Pipe, Howard Sams and Company, Indianapolis, Indiana.

Small Gas Engines, by Alfred C. Roth, Goodhear-Wilcox Company, South Holland, Illinois.

STUDENT WORKSHEET

TUNING A FOUR-STROKE ENGINE

Instructions:

Look up in a dictionary and define in your own words how each relates to an engine:

Torque:

Rod:

Valves:

Compression:

Flywheel:

Condenser:

Ignition:

Armature:

Governor:

Throttle:

Idle Speed:

Shaft:

Cycle:

Describe and explain the use of the following tools and fluids as they relate to small gas engines:

Safety glasses:

Torque wrench and sockets:

Flywheel holder and wrench:

Feeler gauge:

Plug gapping tool:

Engine cleaning solvent:

Gasoline:

Oil:

Screwdriver:

Tachometer:

TUNE-UP SEQUENCE PROCEDURE

Work in small groups to complete a tune-up sequence on a four-stroke engine or observe a demonstration by a qualified mechanic.

Complete:

1. Engine specifications:

   Make _____ Model _____

   Head Torque _____ lb. ft.

   Flying Troque _____ lb. ft.

   Case bolts _____ lb. ft.

   Point gap _____ Plug gap _____

   Valve clearance _____

   High Speed _____ rpm Low Speed _____ rpm

2. Clean the engine:

   Solvent _____ Pressure wash _____ OK _____

3. Check the crankcase oil level:

   Changed _____ Added _____ OK _____

4. Check the fuel level:

   Changed _____ Added _____ OK _____

5. Start the engine and cycle from start to high speed and back to idle to check running operation:

   Comment: _____

6. With the engine running, check for noises:

   Rod noise _____ Valve noise _____ OK _____

7. Torque head bolts and crank case bolts:

   Torqued _____ OK _____

8. Ground spark plug wire and check cranking compression:

   Low _____ OK _____

9. Clean and gap or replace spark plug:

   Cleaned _____ Replaced _____ OK _____

10. Remove and replace the flywheel to inspect, test, repair and adjust the following:

Flywheel key:	Replaced _____	OK _____
Breaker points (GAP)	Replaced _____	OK _____
Condenser (test)	Replaced _____	OK _____
Primary wire and switch:	Replaced _____	OK _____
Ignition coil (test)	Replaced _____	OK _____
Coil Secondary wire:	Replaced _____	OK _____
Torque flywheel nut:	Torque _____ lb.ft.	OK _____
Armature air gap:	Set _____	OK _____
Recoil starter and rope	Replaced _____	OK _____

11. Check the ignition spark:

    Weak _____ OK_____

12. With the engine running and warm, adjust the carburetor and air vane governor:

    High speed jet (under load): Adjusted _____ OK _____

    Low speed jet (idle no load): Adjusted _____ OK _____

    Throttle valve (idle no load): Adjusted _____ OK _____

    Ignition primary switch: Adjusted _____ OK _____

13. Cycle the engine from start to high speed and back to idle to check running operation:

    Readjusted _____ OK _____

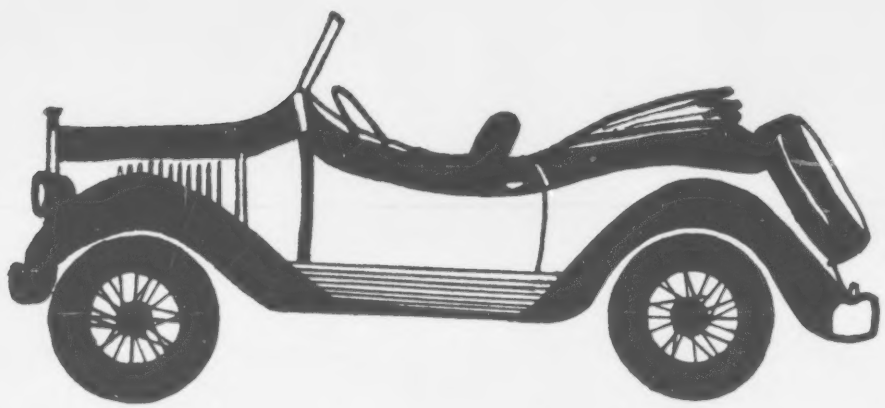
BUYING USED TRANSPORTATION

Objectives:

1. Lists the purpose of the vehicle.
2. Identifies a type of vehicle based upon several factors such as size and cost.
3. Visits car lots to validate selection criteria.
4. Computes costs to own and drive the vehicle for one year.

Related Occupations:

Automobile Tester	D.O.T. 620.281
Motor Vehicle Inspector	D.O.T. 620.281
Safety Inspector	D.O.T. 620.281
Vehicle Safety Inspector	D.O.T. 379.384
Transportation Inspector	D.O.T. 168.168
Purchasing Agent	D.O.T. 162.158



Information:

The purchase of a car or truck is a person's expression of his or her attitude toward transportation. Not only does their personality come through, but their consumer knowledge about the quality of the vehicle, its potential to perform the assigned task, cost factors involved, and very importantly, how the transition will be made as another vehicle is bought and the present one is sold. An example illustrates this point.

University Graphics is a midwest company that do original artwork and layout for advertisements, billboards, commercial publications and manuscripts. The firm was started by two talented artists who were frustrated with employment as salaried workers in a large organization which could not reward their creativity or potential for productivity. Out of this frustration grew a small business where the principal product was original illustrations. As the firm began to grow, business was drawn from nearby cities, which caused both partners to travel extensively visiting prospective customers, and then opening branch offices. Transportation was a problem. Two cars were needed. On the one hand it was necessary to give the appearance that the firm was doing very well financially, which it was, but on the other it was necessary to conserve assets to expand the business during this period of growth. In addition, comfort and room were important since extensive driving was to be done, usually with entertainment as a part of the trip when the customer was taken to lunch. Large luxury cars were needed. The decision was made to buy two used cadillacs, one an Eldorado, the other a sedan. Both were four years old and financed out of the business. At the end of two years, both were traded in on newer models at the dealership where they were purchased, this time for two year old models. It has been five years now since the firm began buying used luxury cars. Now they purchase one year old models and trade them in every two years before major repairs are encountered.

There are several reasons for buying used transportation. First, used cars and trucks are usually cheaper to purchase than new ones. They are also a hedge against inflation. That is, the drastic drop that occurs in the value of a new car after one or two years is avoided since the price of a used one is not only more stable but predictable. For example, current models typically drop 25% in value the first year and 20% the second year. Third, it is fun to buy, use, drive, fix and then sell used cars and trucks where no drastic commitment is made on the part of the buyer because they are not as valuable as their new counterparts, and because they can be priced competitively when they are sold. This is typically not the seller's option when a car or truck is purchased new. Finally,

buying used vehicles allows ownership of many cars and trucks which are not otherwise available to the average person. Luxury cars and foreign cars, for example, only one to three years old are easily within the means of many average income buyers.

Before visiting used car lots, it is very important that the purpose of the car is determined. It is not wise to allow the used car or truck salesman to sell you what he thinks you ought to have on his terms. You are the one who needs the vehicle, and you should be the one to decide exactly what it is that you need.

When the purpose of the car has been clearly identified, such as for a particular type of business, the right car for that purpose must be selected. It is very important to remember that the purpose for the vehicle and the type of vehicle are very closely related. A large, heavy car or truck, for example, should not be purchased if the purpose is for short run delivery or transportation in congested traffic. A light utility vehicle would be more appropriate.

Cost is a third factor which must be determined so that the vehicle which matches the stated purpose is within the financial means of the buyer. Cost includes the:

1. Purchase price,
2. Credit charges and payments if the vehicle is financed,
3. Cost for expected repairs and
4. Cost for license and insurance.

After the preliminary factors of purpose, type of vehicle and cost factors have been determined, it is time to actually go out and look in the marketplace. Typically, the prospective buyer should consider the following when he enters the marketplace.

1. The right vehicle must be located.
2. A careful inspection of the car must be made. A mechanic or diagnostic test center should be hired to make the inspection. It's money well spent.
3. In the event the car or truck is purchased, repairs to bring the vehicle to the desired condition must be considered. The person performing the inspection can supply a list together with approximate costs. These costs can also form the basis for discussion with the owner to reduce the cost or, in the case of a dealership, perhaps perform the actual repairs before the car is purchased.
4. A strategy also must be formulated just in case the vehicle is a lemon. That is, will the dealer repair

it at his expense, or how much will it bring in the marketplace if it must be resold in the very near future at a loss.

5. And finally, it should be considered at the outset, just how you are going to sell the car or truck yourself when it has served its purpose.

Implementation:

Each student sho completes this exercise should identify a particular vehicle which meets a personal or business need. Both the preliminary and field trip part of the form should be completed. The class can complete the preliminary portion together in a discussion class setting after information is presented by the teacher from the resources listed at the end of the lesson. A field trip should then be used to get students actively involved actually looking at and determining the costs involved with specific vehicles. Used cooperative dealerships and used car lots should be contacted in advance so that they can be prepared to assist the class with questions, standard forms, information about their vehicles and costs associated with ownership and maintenance.

An alternative exercise is to have several dealership representatives visit the class to discuss buying used transportation. Servicemen could also accompany them to explain about expected maintenance and operation costs. A third alternative would be to allow students to visit car lots individually and report findings to the class using the standard format which follows in the procedure as a procedure sheet.

As a part of the exercise, the following form should be completed by each student.

CHECKLIST FOR BUYING A VEHICLE

PRELIMINARY INFORMATION

1. Purpose of the Vehicle_____

_____

2. Type of Vehicle_____

-Size_____ -Accessories_____

-Engine_____ _____

-Transmission_____ _____

-Suspension_____ _____

-Brakes_____ _____

-Color_____ _____

-Seating_____ _____

-Exterior Features_____ _____

-Tires_____ _____

OPERATIONALIZING THE PURCHASE

3. Identified Vehicle_____

_____

4. Cost Factors: Purchase_____

Finance Charges_____ Payments_____/mo

Expected repairs this year_____

License and Insurance_____

5. What's wrong with the vehicle?

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

6. How will I dispose of the vehicle when its served its purpose?

_____

Resources:

Redbook. National Market Reports, Inc., 900 S. Wabash Avenue, Chicago, IL.

Motor Trend, June, 1972.

Car Buying Made Easier. Ford Motor Company, P. O. Box 1973, The American Road, Dearborn, MI 28121.

Consumers Guide.

Money Management: Your Automobile Dollar. Household Finance Corporation, Prudential Plaza, Chicago, IL 60601.

STUDENT WORKSHEET

BUYING USED TRANSPORTATION

Instructions:

Each student should explore the possibilities of buying two used vehicles and complete the following checklist for each.
1. Used automobile for personal use and pleasure
2. Commercial vehicle for a specified business purpose.

CHECKLIST FOR BUYING A VEHICLE

1. Purpose of the vehicle _____

_____

2. Type of vehicle _____

_____

3. Locate and identify the vehicle _____

_____

4. Cost factors: Purchase _____

Finance charges _____ Payments _____/mo

Cost of needed repairs _____

License _____ Insurance _____

Fuel economy _____ mpg

5. Inspect the car _____

Size _____ Accessories _____

Engine _____ _____

Transmission _____ _____

Suspension _____ _____

Brakes _____ _____

Color _____ _____

Seating _____ _____

Exterior Features _____

Tires _____

6. Identify problems, malfunctions and needed repairs:

_____

_____

_____

_____

_____

7. How will the vehicle be disposed of when it has served its purpose?

_____

_____

_____

8. After evaluating 1 - 7, do you think the purchase of <u>this</u> vehicle would be advisable? _____

_____

MONITORING SURFACE TRANSPORTATION NOISE

Objectives:

1. Locates monitoring stations on transportation arteries.
2. Records noise levels during traffic hours.
3. Writes noise level report for local government review.

Related Occupations:

City Planner	D.O.T. 199.168
Transportation Superintendent	D.O.T. 184.168
Safety Engineer	D.O.T. 909.128
Safety Inspector	D.O.T. 164.284

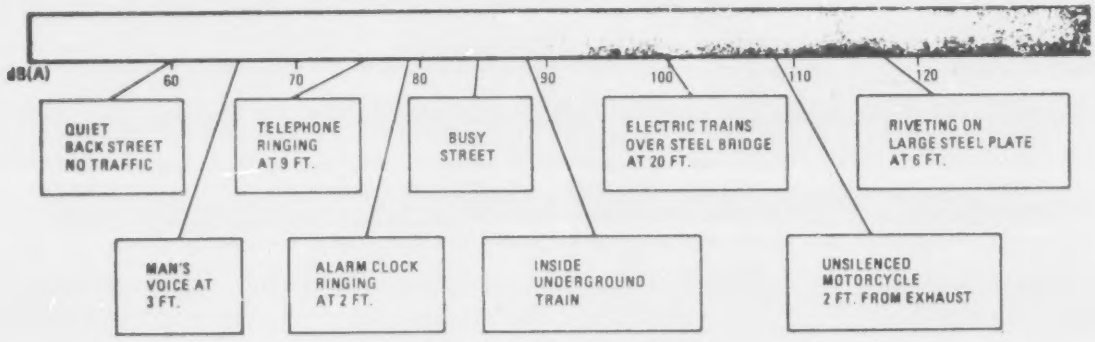
Information:

Noise, defined as unwanted or excessive sound, is now broadly recognized as a form of environmental degradation. Noise can be annoying, can interfere with sleep, work or recreation and, in extremes, may cause physical and psychological damage. Until recently, both industrial and transportation noise problems were largely excused as part of the cost of progress. This is no longer acceptable.

Undoubtedly, the most far reaching noise source in society today--and one that is the most difficult to avoid--stems from transportation operations. Projections into the future indicate that by 1985 there will be more than 430 million aircraft operations per year compared to 80 million operations today, 130 million automobiles in use versus 84 million, now, and 28 million trucks as compared to 17 million today. Together, these portray a great increase in the volume of noise emanating from transportation services.

A broad-based drive is now needed to control this difficult aspect of transportation--a drive which will achieve the goals of personal privacy and environmental quality while continuing the flow of needed services for a quality society.

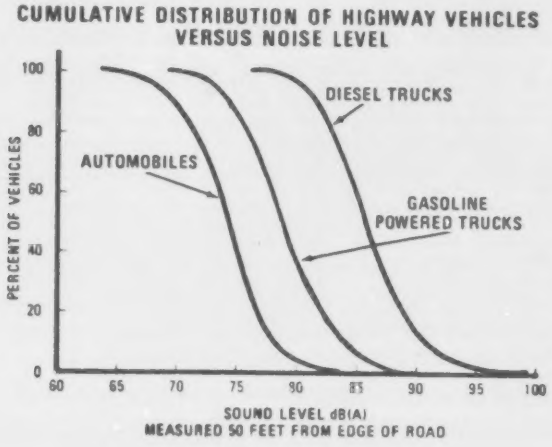
Noise sources are governed by many factors, such as: (a) the design, construction, maintenance, and manner of operating a vehicle, and (b) the path that the sound waves travel to reach the observer (i.e., distance, obstructions, reflections off surfaces, etc.). Typical values of noise levels from some commonly occurring events are shown to provide familiarity with the decibel (dB) noise-measuring scale.



Highway vehicular noise is clearly the most pervasive transportation noise source in our society today, and this is growing rapidly as vehicle registrations, miles of roads and highways, and average speeds and vehicle utilizations increase. Nearly every state in the union has some sort of noise regulations within its motor vehicle code, but only one state (California) is at this time effectively pursuing the noise reduction intent of such codes. All states should consider the benefits that their residents can obtain from effective regulation. Industry, and the Federal and State Governments, should increase the tempo of research on vehicular noise reduction. Federal, state and local highway and city planners must design new highways and establish land-use zoning to avert future noise problems. And responsible authorities must take corrective steps to improve present

high noise situations, such as establishing speed limits, traffic-flow control systems and controlled truck routes.

Noise generated by automobiles, trucks, and motorcycles emanates from the maze of roads which surrounds the urban and suburban resident. The number of highway vehicles has become so large and the people live so much closer to the sources of noise that vehicular traffic noise is a major concern in anti-noise programs at this time. The graph below portrays the cumulative distribution of highway vehicle noise as measured 50 feet from the edge of a roadway (for example, the percentage of automobile noise sources above 75 dB (A) is 37%). The difference in noise levels between automobiles and trucks is evident, as is the range of noise generated by each type of vehicle.



The automobile, when operated in a safe and sensible manner, is a relatively quiet machine. It is usually well muffled and is generally designed for the comfort of the driver and passengers. Noise control has become a prominent factor in auto design lately, because of the selective purchasing habits of the American people. Such curbs of internal vehicle noise have also resulted in a substantial benefit to the roadside community. However, if one doubts the inherent noise generating capability of an automobile, simply remove the muffler, open the hood and remove the air cleaner from the family car and listen to the cacophony of engine sounds that result. Further, it should be noted that, even in a good state of repair, the family auto can be operated in such a fashion (low speed, maximum acceleration) as to produce nearly as much noise as the large diesel highway trucks. The difference between the noise made by an auto cruising at constant speed and an auto accelerating at open throttle can be 7 to 15 dB. Removal or modification of noise control equipment (e.g., mufflers) can further increase the noise level under any condition by 10 to 20 dB.

On today's high speed highways, much if not most noise produced by vehicles can be attributed to the tires. Recent tests have shown, for example, that a passenger sedan fitted with "quiet tires" produced a sound level of 73 dB (A), 50 feet to the side of its path while coasting (engine turned off) at 70 mph. Placing snow tires on the rear wheels of the same vehicle resulted in a 5-dB increase in the noise level under otherwise similar test conditions.

Implementation:

Students should work as a group to develop and then implement a plan to monitor surface transportation noise during peak traffic times, for example, at 8:00 a.m. and 4:30 p.m. from Monday through Friday. Average noise level, peak noise levels as well as vehicles per hour can be monitored. Vehicles per unit time can be monitored with a counter, or visually. The number of trucks should be monitored so that their percentage of the surface traffic can be computed as well.

Assistance should be asked from the local city planning commission to map the traffic arteries, procure necessary equipment, design the final report, and implement the project. In return, the results of the report can be made available with recommendations to the local government and presented at a council meeting.

Resources:

Resources include maps, traffic counters, timers, clip boards and a noise meter set on a tripod. The traffic counter can be eliminated if visual means are used to count the number of cars and trucks that pass per hour. Other resources available include:

Citizen Guide to Energy Conservation, available from the Citizens' Advisory Committee on Environmental Quality, 1700 Pennsylvania Avenue, N.W., Washington, D.C. 20006.

Transportation Noise and its Control, developed by the United State Department of Transportation and available from the Government Printing Office as publication number 5000-0057.

STUDENT WORKSHEET

MONITORING SURFACE TRANSPORTATION NOISE

Instructions:

Students should work in committees to monitor surface transportation noise during peak traffic times, i.e. 8:00 a.m. and 4:00 p.m. Monday through Friday. Maps should be drawn to indicate main traffic arteries and monitoring positions.

1. Collect equipment needed:

   a. Map _____

   b. Traffic counters _____

   c. Timers _____

   d. Noise meter on tripod _____

   e. Clipboards _____ paper _____ pencils _____

2. Unit of time selected for monitoring _____

   Day (s) of week _____

3. Exact location of test:

   a. Map _____

   b. City _____

   c. Highway number _____

   d. Mile marker _____

4. Noise levels

   a. Average _____dB (A)

   b. Peak _____dB (A)

   c. Lowest _____dB (A)

   d. Comments _____

   _____

   _____

5. Number of vehicles monitored

		Percent of total
a. Gasoline trucks	_____	_____ %
b. Diesel trucks	_____	_____ %
c. Small trucks	_____	_____ %
d. Passenger cars	_____	_____ %
e. Sport cars	_____	_____ %
f. Motorcycles	_____	_____ %
g. Buses	_____	_____ %
h. Airplanes	_____	_____ %
i. Helicopters	_____	_____ %
j. Trains	_____	_____ %
k. Other	_____	_____ %

6. Conclusions and comments: _____

_____

_____

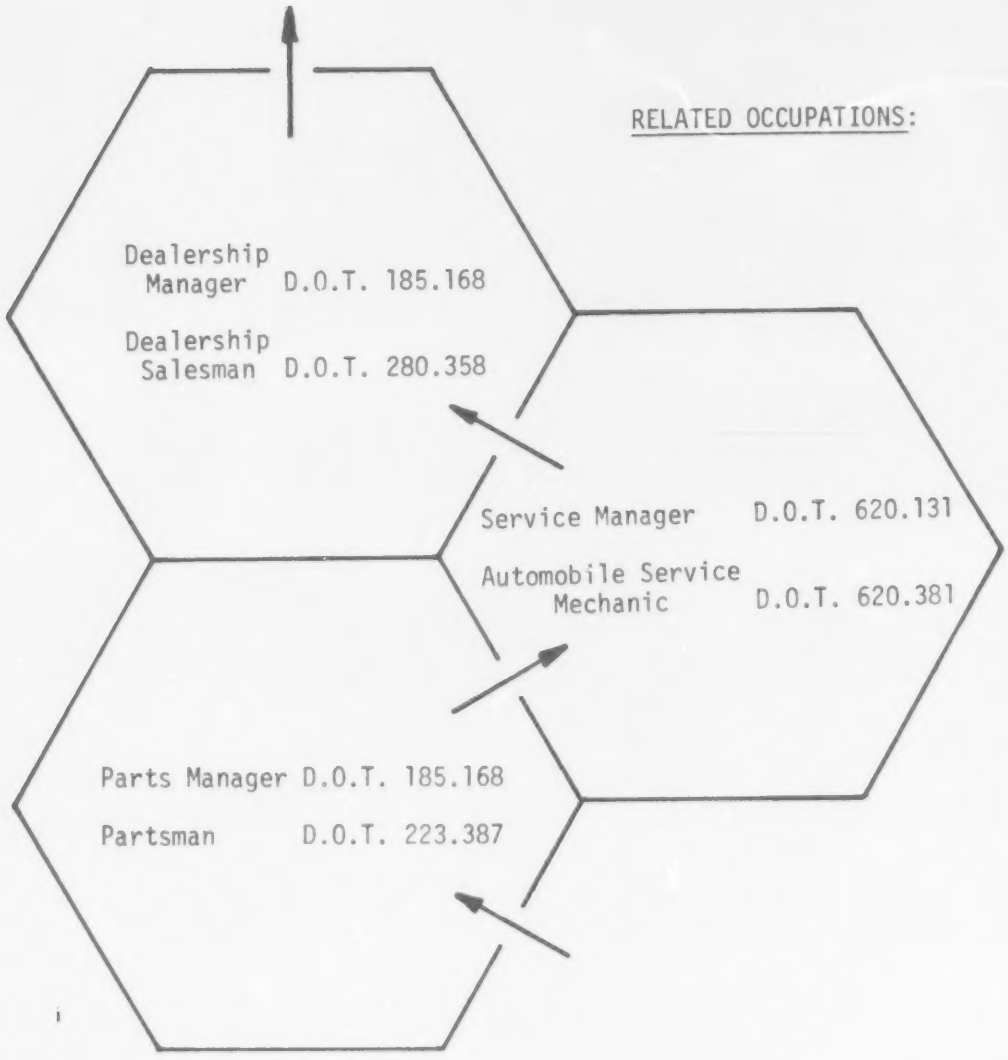
_____

_____

ADVANCING IN THE RETAIL CAR AND TRUCK BUSINESS

Objectives:

1. Identify a job ladder.
2. Establish career objectives.
3. Specify requisite education and experience.
4. Establish a timetable for achieving established objectives.



Information:

Economists estimate that the automobile creates seven out of every ten jobs in America. They also contribute in a very meaningful way to almost every walk of life. We are all involved with automotive transportation and we are all affected by it. Many work directly in retail car and truck businesses as dealers, parts managers, sales people and mechanics. Others work in peripheral occupations in manufacturing, financial establishments and service enterprises making components, lending money to buyers and building roadways.

In 1960 there were about 55 million cars. Today, there are over 100 million cars with another 20 million trucks and buses, and the related job market is now more than 13 million.

Franchised dealerships sell and service new cars and trade-ins. Under the free enterprise economic system, retailers compete with one another for customers, and then try to keep them as repeat business. Customers typically choose the car they want and then the dealer that gives them the lowest prices and the best service after the sale. While new car sales are the basic part of the enterprise, service and parts are necessary to build the integrity of the business around customer needs. Parts men, the service area, the accounting department, secretaries, financial managers, and even a leasing department may make up the franchise dealership team. The size of the business typically depends upon the population served, the brand of car or truck, and the organizational ability of the owners.

Advancing in the retail car and truck business requires first that the available jobs are identified in a sequence that is both progressive and logical. Secondly, goals must be formulated which take into account the time necessary to make advancements and the education and training which are necessary to assume additional responsibilities. The key to success is making present work count toward future goals on a daily basis. Keeping score is done by establishing realistic objectives on a timeline beginning with the present. An example will make this clearer.

> Harold Miller wanted to be a mechanic from his youth. He enrolled in the automechanics program in high school. After graduation he was anxious to get started and advance in the auto field, but also wanted to travel in America and abroad. Harold decided that if he could be guaranteed additional training in the service, he would join for four years. His plan for advancement included a four year timeline during which he would develop a work record as a car and truck mechanic, receive additional training in his specialty, save enough money to purchase $3000 in tools, and during the same period, see America and Europe on his leave time. Before Harold joined, he had a clear understanding of the mechanic jobs he would be doing, the schools he would attend and where, a savings plan which would allow saving money each month for tools, and a list of the places that he could visit during his tour of duty. His first career goal accounted for the sequence of jobs in his field, the required schooling, the timeline for advancement, and his work on a daily basis would count on a cumulative basis. Advancing toward career goals in the less controlled civilian community is planned in the same manner.

There are many jobs from which to choose in the retail automobile and truck field. Three general categories are retail car and truck sales, parts sales, and service in one of the many shop positions actually repairing vehicles. Typically, salesmen start out as sales assistants; parts men start out as stock clerks and delivery men; and mechanics begin in car preparation, on the rack, as mechanics helpers and finally, graduate to a stall on the line. Shop foremen come from the ranks of the line mechanics, whereas service managers will have experience in all three areas and have a desire to work with customers and interpret their automotive problems to the shop foreman or line mechanics.

Many high schools and colleges offer automotive courses in both regular and adult vocational programs. If you are now in high school, consult the counselor. If you've graduated, but are still under 21, you may still be eligible to enroll in these courses during the day, or if you are older as an adult at night. If you are out of school and don't know where to find available training, write to the State Superintendent of Education in your state. The address is available from any high school. They can also give you the names and addresses of both public and private colleges that offer additional training. Schools can be checked out by writing their accrediting association: National Association of Trade and Technical Schools, 2021 "L" Street, N.W., Washington, D.C. 20036. You should also plan to make a visit to the school before you invest money or sign for a course. There are a number of home study schools that offer quality programs to students. These can be checked out by writing: National Home Study Council, 1601 Eighteenth Street, N.W., Washington D.C. 20009. Veterans receive financial assistance going to school up to 36 months, and sometimes longer. They also assist if you are in an apprenticeship program. For information contact: you local veterans office or write to: Veterans Administration, Washington, D.C. 20420. Automobile manufacturers offer their own programs for men and women in the retail car and truck business. Four addresses which can be used to inquire about job entry and advancement programs are:

General Motors Corporation
General Motors Building
Detroit, MI 48202
Attn: Product Education and
Training Section

Ford Motor Company
The American Road
Dearborn, MI 48121
Attn: Career Information

Mo Tech Automotive Education Center
35155 Industrial Road
Livonia, MI 48150

Volkswagen of America, Inc.
Englewood Cliffs, NJ 07632
Attn: Service Training Department

To receive more information about the retail car and truck business and their association write National Automotive Dealers Association, 2000 K Street, N.W., Washington, D.C. 20006.

Implementation:

Each student should present a plan for advancement in the retail car or truck business and present this plan to the class for validation. That is, the logic and sequence of the student's plan, together with the necessary educational preparation should be presented to peers for defense and validation. The student should be prepared for this presentation with substantive information from such sources as potential employers, schools, the armed services, accrediting agencies and professional associations. Reactions from peer members should evaluate the timeline, sequence, logic of the advancement plan, realism of the career objectives and the value of present activity. Care must be exercised to assure that the class is serious and sincere in their concern to help validate the plan. It is not appropriate that class members should evaluate the goodness of the student's desire to work in a specific field.

As a point of departure, the student should:

1. Identify a job ladder consisting of a sequence of jobs.
2. Establish one or more specific career objectives which can be attained through this work.
3. Specify requisite education and experiences which will develop the necessary skills to advance through the job ladder on a schedule.
4. Establish a timetable for achieving the established objectives.

It may be helpful to invite a regional representative from one of the major car manufacturers to bring an established dealer to your classroom for a presentation about the retail car and truck business. They can be located by contacting the dealer and have at their disposal a number of timely and pertinent resources which can be utilized to inform class members of potential opportunities available and how to get there.

Another method to get the message across is to take class members to dealerships to chat with people doing the type of work in which they wish to advance. An alternative method is to have individual students collect tape recordings from these same people at the place of employment using a tape recorder and a standard format and then play them to the class as part of their presentation.

Resources:

In addition to the above cited references, the following should be contacted for information about the retail car and truck business:

Automotive Instructional Material, Automotive Service Industry Association, 168 North Michigan Avenue, Chicago, IL 60601.

General Motors Dealership Career Day Kit, Career Program Section, General Motors Corporation, Room 8-151, General Motors Building, 3044 W. Grand Blvd., Detroit, MI 48202.

Material for Occupational Education: An Annotated Service Guide, by Patricia Schuman, R.R. Bowker Company, Order Department, P. O. Box 1807, Ann Arbor, MI 48106.

STUDENT WORKSHEET

ADVANCING IN THE RETAIL CAR AND TRUCK BUSINESS

Instructions:

Draft an oral report to your class which identifies career objectives, includes requisite educational experiences, and provides a timetable for achieving stated objectives in the retail car and truck business.

Points to consider:

1. For what job am I now qualified? List job or jobs, job description, and the D.O.T. number. See Dictionary of Occupational Titles.

_____

_____

2. What would I like to be doing in five years?

Job title _____ D.O.T. _____

Job description _____

_____

_____

_____

What are the experiences and educational requirements? _____

_____

_____

How will I fulfill these requirements? _____

_____

_____

_____

_____

What material and personal compensation can I expect to receive?

_____

_____

3. In 10 years?

4. In 20 years?

5. In 30 years?

6. At retirement?

7. Will my career goals provide me with personal satisfaction, leisure time, and the material possessions that I desire?

8. Is the timeline for advancement logical?

9. Are the educational requirements within my abilities?

10. Is my character and personality suited to my career objectives? (attach information which tends to verify this)

11. Is my present activity of value to my career growth?

DEVELOPING "MY JOB" IN TRANSPORTATION

Objectives:

1. Lists present and next job for which qualifications are being developed.
2. Completes current job description for preferred occupation.
3. Prepares current resume for job application.
4. Identifies and collects job opportunities in preferred occupation.
5. Depicts preferred work in scrapbook from photographs, magazines, newspapers, trade journals and associations.
6. Lists places where current information about preferred work can be secured.

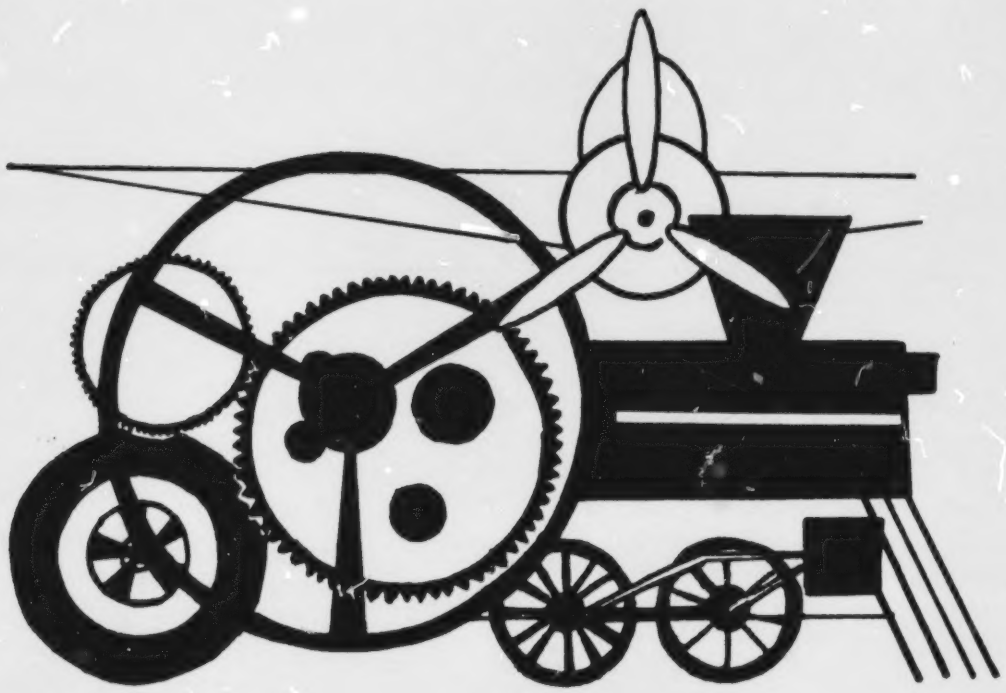
Related Occupations:

Present occupation for which qualifications are being developed:

_____ D.O.T._____

Next occupation for which qualifications are being developed:

_____ D.O.T._____



Information:

Being aware of present and future opportunities in the job for which preparation is being made can enlarge the possibilities for self fulfillment and contribution to society in one's work. Frequently, students in training do not associate present training with future work, and as a consequence, become discouraged and underachieve.

Present training has much more meaning if it can be related to future rewards. In fact, anticipating the full measure of success in a future job situation gives meaning to present activity. That is, aiming at the future goal gives purpose and incentive to make every day and training encounter meaningful in the context of future skill needs for success and fulfillment at the place of employment.

It is important, then, that the student develop the awareness of his future role in preferred work to the fullest before or concurrent with training in school. Concrete rather than abstract data should be collected so that the possibility for misunderstandings about future work roles reduced to an absolute minimum. Two strategies to a solution to the problem should be used. First, definition of what constitutes an awareness of future work role expectations should be developed. That is, the criteria for definition, such as title, job description, educational and work requirements etc., should be listed using a standard format. This constitutes the written information base accessible to the student and should be filed in his portfolio. Secondly, developing an array of photographs, newspaper want ads, tape recordings of interesting interviews, and journal and magazine articles allows the student to express preferences for situations and information which describe him/her in preferred work. This is very important since work itself is an expression of the occupational self concept and the student is exhibiting an early form of this behavior.

Although some latitude should be given to the student in developing the written information base, the general categories of "self" and "world of work" should be used to classify sub-headings. The following are suggested to reinforce the student's selection of preferred work:

Name_____ Date_____

Inventory Preferences:____ Kuder_____

____ Strong_____

____ OVIS_____

____ GATB_____

____ Other_____

Awareness of Occupational and Educational Choices:

____Assessment of Career Development_____

____Other Instrument_____

Primary Abilities: Reading_____ Mathematics_____

Self appraisal of interpersonal relationships:_____

_____

Self appraisal of significant data from family history such as family expectations, father's trade, financial capability, marital status, etc.

_____

_____

Preferred work: Job Title_____ D.O.T._____

____ Job description (attached)

____ Personal resume with references (attached)

____ Job application for one or more preferred places of employment (attached)

____ Specific places where current information about preferred work can be secured (attached)

Education necessary for preferred work:

____ First Job_____ Education_____

____ Second Job_____ Education_____

Any special requirements for success at the job:

_____

_____

Preparing a portfolio of concrete rather than just written information allows the student many more opportunities for self expression. Typical examples of expressions for this project include:

____ A collage of pictures from magazines.

____ Illustrations or pictures of current technical advances in the field such as a new engine or conveyance.

____ Photographs of adult models who are successful in the transportation field such as an inventor or local celebrity.

____ Short success stories from trade journals or the newspaper.

____ Individual projects made by the student such as a hand tool or a project from another class.

____ Tape recording from an interview with a local specialist who works in preferred occupation.

____ Collection of want ads indicating opportunities in preferred work.

____ List of schools with brochures describing available training opportunities.

____ Slides or photographs taken at prospective places of employment.

____ Slides or photographs taken at coop work station or place of employment showing the student in uniform, at work in his specialty or with others who work in preferred occupation and with whom associated.

____ Letters of praise for work, certificates, diplomas, credentials, and other documents which recognize progress in preferred work.

____ Lists and pictures of tools and equipment used in preferred work.

____ Examples of work completed at present place of employment.

Many other examples are available and will be generated by students given the latitude to express themselves freely. It is important, however that the student not attempt more than reasonably can be completed in the time allocated. For this reason, those which will be completed for presentation to the class should be identified in advance with the clear understanding of how the assignment will be evaluated.

Implementation:

Students should complete individual projects and present their portfolios to the class in a report for reality testing and peer validation.

It may be helpful to have someone who works in the preferred occupation come to the class to react to the student and class at the end of the report to add credence to the information presented and explain or expand certain topics for the class. Another strategy is to have a coop student bring his employer to act in the same capacity. While it is acknowledged that the presentation is for the purpose of allowing the student to express his occupational preference and knowledge, it should not be construed as a competition for individual student performances before the class. Misunderstandings and stressful situations placed on less capable performers will be reduced if this is explained to the class in advance when the assignment is made and discussed. Samples of previous projects should be presented by the teacher for the class to establish this point.

Resources:

Several resources are available and should be a part of the teacher's file to get students started. Among sources where information can be secured by the teacher are:

Public Relations Department, American Trucking Association, 1616 P Street, NW, Washington, DC 20036.

U. S. Department of Transportation, Washington, DC 20590.

Automotive Service Industry Association, 168 North Michigan Ave., Chicago, IL 60601.

National Automobile Dealers Association, 2000 K Street, NW, Washington, DC 20006.

Dictionary of Occupational Titles, Volumes I and II, United States Government Printing Office, Washington, DC 20402.

Occupational Outlook Handbook, United States Government Printing Office, Washington, DC 20402.

Handbook of Transportation in America, Popular Library, 355 Lexington Avenue, New York, NY 10017.

Your Career in Transportation, Julian Messner, Inc., 1 West 39th Street, New York, NY 10017.

Also contact the local employment agency, recruiter and school guidance department about the availability of survey, preference and achievement instruments for your class.

STUDENT WORKSHEET

DEVELOPING "MY JOB" IN TRANSPORTATION

Instructions:

Use the following to develop an awareness of yourself and the world of work. The written information base will be a valuable tool in determining future career choices. The concrete data will enable you to see yourself in preferred work experiences.

Name _____ Date _____

Inventory Preferences: Kuder _____

Strong _____

OVIS _____

GATB _____

Other _____

Awareness of Occupational and Education Choices:

Assessment of Career Development _____

Other Instrument _____

Primary Abilities: Reading _____ Mathematics _____

Self appraisal of interpersonal relationships: _____

_____

Self appraisal of significant data from family history, such as family expectations, father's trade, financial capability, marital status, etc.

_____

_____

Preferred work: Job title _____ D.O.T. _____

Job description (attached)

Personal resume with references (attached)

Job application for one or more preferred places of employment (attached)

Specific places where current information about preferred work can be secured (attached)

Education necessary for preferred work:

First job _____ Education _____

Second job _____ Education _____

Any special requirement for success at the job: _____

_____

Concrete information for self expression in the world of work:

_____ A collage of pictures from magazines

_____ Illustrations or pictures of current technical advances in the field such as a new engine or conveyance.

_____ Photographs of adult models who are successful in the transportation field.

_____ Short success stories from trade journals or the newspaper.

_____ Individual projects made by the student, i.e. a hand tool or a project from another class.

_____ Tape recording from an interview with a local specialist who works in preferred occupation.

_____ Collection of want ads indicating opportunities in preferred work.

_____ List of schools with brochures describing available training opportunities.

_____ Slides or photographs taken at prospective places of employment.

_____ Slides or photographs taken at coop work station or place of employment showing me in uniform, at work in my specialty or with others who work in preferred occupation and with whom associated.

_____ Letters of praise for work, certificates, diplomas, credentials, and other documents which recognize progress in preferred work.

_____ Lists and pictures of tools and equipment used in preferred work.

_____ Examples of work completed at present place of employment.

UNIT III

ENTREPRENEURSHIP

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TO THE TEACHER

As you know, the Preparation Stage in career education is the time when students begin to commit themselves to implementation of a preferred career plan. A potential weakness of preparation level career education programs is that students too often only become acquainted with the occupational role of "employee". That is, students learn about what it may be like to work in a business, industry, office, or other type of large corporation. Seldom do students have any knowledge of opportunities in owning their own business.

This short, introductory unit was created to help students develop awareness of "Entrepreneurship in Transportation". It's purpose is to cultivate awareness and motivation. By the time students complete the eight readings and seventeen activities in the unit, they should have a better notion of additional career opportunities in transportation. Following is a brief summary of each of the lessons contained in the unit.

Entrepreneurship in Transportation

In this reading, students are introduced to what is a small business and to the three groups which constitute self-employed persons. A variety of transportation enterprises are listed to give students an idea of the types of small businesses available in the transportation field. The Standard Industrial Classification Manual (1972, 220-234), was the source for this listing. The activities for this reading are designed to help students to evaluate the extent of their current career planning.

Going Into Business

This reading presents the advantages and disadvantages of small business ownership. It's purpose is to demonstrate how working conditions of a self-employed person differs from a salaried job. The first activity for this lesson requires students to define a number of terms which may be encountered for the first time. In the second lesson, students are to interview a small business owner (preferably in transportation) to gain a better idea of working conditions and background of a typical entrepreneur.

What's It Like?

This reading is a case study of a day in the life of a small

business owner. Even though the business discussed is not in transportation, this example does help to reinforce the fact that working conditions are decidedly different for a small business owner. It is recommended that the film New Entrepreneur be shown to supplement the reading. This film depicts a young black woman who operates a transportation baggage pickup service. The first activity for this reading demonstrates to students the wide variety of job tasks that an entrepreneur performs. The second activity attempts to obtain some closure for Readings 2 and 3 by asking students to record the advantages and disadvantages of small business ownership. Keep in mind that advantages and disadvantages are relative terms depending on each person's perspective.

Are You The Type?

The personality of a self-employed person appears to be highly related to job success. This reading introduces the factors which seems to characterize successful managers. Even though personality shouldn't be overemphasized, there is value in students examining their own characteristics in relation to those of successful persons. The activities consist of self and other ratings of the students' personal characteristics. It is advisable that you emphasize strengths rather than weaknesses in discussions of students' ratings.

What Business Should You Choose?

This reading introduces three factors that are points of departure in helping students to identify possible business opportunities: their own background, other peoples needs and wants, and future trends. The activities for this lesson are designed to help students apply their understanding of these factors.

Your Chances of Success

In Reading 6, the reality of conditions related to business failures are discussed. The purpose is to help demonstrate to the student that managerial experience is essential to successful business ownership. The activity for this reading requires the student to differentiate those conditions of business failure which result from poor management, from those over which the owner has little control. Emphasize that a competent manager must learn to deal with adversity.

Your Return on Investment

This reading continues to examine realities of owning a business. Emphasis here is on considering the amount of return on investment a person can expect from various types of business. The two activities

require students to perform some simple calculations related to figuring percentages ratios and medians. In addition to helping students to apply understanding of the concepts presented in the reading, these activities demonstrate the importance of computational skills to operating a business.

Still Interested?

The last reading introduces students to sources and types of information for small businesses. The checklist activity consists of a series of questions which can help to more meaningfully guide the student who is interested in obtaining further information.

Resource Materials

Even though this unit "ends" with Reading 8, a number of meaningful activities can be conducted related to entrepreneurship in transportation. You have been provided with publications available from the Small Business Administration and from the Bank of America. It is suggested that you invite a representative of the SBA to your class to explain more fully the publications and services of SBA. You should also enlist the help of a local librarian to explain the types of resources available in your community. By all means, continue to encourage and assist those students who were "turned on" by this unit to strengthen their educational and work experience backgrounds in a way that will help them to develop essential prerequisites for owning a business of their own.

Related Curriculum Materials

Following are commercially related materials that can be used to augment the readings and activities in this unit.

ACI Films, Inc.
35 West 45th Street
New York, N.Y. 10036

New Entrepreneur. Depicts owner of a transportation business, 13 minute color film, 1974, $175.00

Instructional Materials Laboratory
8 Industrial Education
University of Missouri
Columbia, Missouri 65201

To Become An Entrepreneur. Student handbook for distributive education students, $3.00.

Eye Gate House, Inc.
Jamaica, N.Y. 11435

Focus on the Small Business Owners. Four filmstrips and cassettes on restaurant, boutique, travel agency and motel owners, $42.64.

Learning Arts
P.O. Box 917
Wichita, Kansas 67201

Ways of Working. Twelve filmstrips and cassettes, one of which is entitled "Small Business Owners". Individual titles - $15.00.

The Baker & Taylor Co.
Momence, Illinois 60954

Career Opportunities, Part 1. Four filmstrips, one of which is entitled "Self-employment". Complete set $25.00.

Richard Rosen Press, Inc.
29 East 21st Street
New York, N.Y. 10010

Your Future in Your Own Business. Book, 1969, $4.80.

Reston Publishing Co., Inc.
P.O. Box 547
Reston, Virginia 22090

Entrepreneurship - Playing to Win. Book, 1974, $15.95.

Acknowledgments

The reading and activities for this unit were reproduced or adapted from the following non-copyrighted sources:

Metcalf, W.O. Starting and Managing a Small Business of Your Own. Washington: Small Business Administration, 1973. (Source - Supt. of Documents, No. 4500-00123, $1.35).

Stevenson, G. Working for Yourself: What's it Like. Occupational Outlook Quarterly, 1973, 17(1), 20-30.

Appreciation is extended to the Springfield, Illinois Office of SBA for their assistance in preparing this unit.

SELF-EMPLOYMENT IN TRANSPORTATION: OUTLINE OF READINGS AND ACTIVITIES

Readings	Activities
1. Entrepreneurship in Transportation	1.1 Present Career Goals 1.2 Career Planning
2. Going Into Business	2.1 Vocabulary 2.2 Interview Guide
3. What's It Like	3.1 Identifying Work Tasks 3.2 Advantages and Disadvantages
4. Are You The Type?	4.1 Self Rating 4.2 Rating by Family Member 4.3 Rating by Employer 4.4 Interpreting Your Rating
5. What Business Should You Choose?	5.1 Background and Experience 5.2 Needs and Wants 5.3 Predicting the Future
6. Your Chances of Success	6.1 Causes of Business Failure
7. Your Return on Investment	7.1 Figuring Percentage Ratios 7.2 Case Study
8. Still Interested?	8.1 Checklist for Going Into Business

READING 1

ENTREPRENEURSHIP IN TRANSPORTATION

In which the reader becomes aware of self-employment as a possible career goal

How about that for a title! The term en-tre-pre-neur is a French word which refers to "a person who organizes and manages a business undertaking". In this lesson and others that follow, you will be learning about what is involved in being an owner-manager of a small business. Most young people are very independent and want to be on their own. However, very few individuals give much serious thought to owning a business. Such a goal may right now seem to be beyond reach. Very few dreams come true, however, unless you begin to plan for them. By the time you complete the lessons and activities for this unit on Self-employment in Transportation, you will have a better idea of whether you want to pursue the possibility of owning your own transportation business.

What is a Small Business?

The definition of a small business is sometimes very complicated. The U.S. Government has various definitions it uses to classify small businesses. For example, a hotel and motel business is classified as "small" if its annual receipts do not exceed $2 million dollars. An air transportation business is "small" if it does not employ more than 1,000 persons.

These definitions, however, are ones which we will not be concerned with. The purpose of this course of study in transportation, is to help you become more aware of opportunities for self-employment. Therefore, our use of the

term small business will be to refer to companies which are owned and operated by only one to five people.

Transportation Enterprises

Most people only think of transportation businesses in terms of airlines, railroads or urban transit systems. It is true, that such companies as American Airlines, Amtrak, and the Chicago Transit Authority (CTA) employ thousands and thousands of workers. In addition to these giant companies, however, there are also many small businesses in transportation which move people and goods by air, land, sea, and pipeline.

The type of small business found in the United States may vary a great deal depending on the geographic location. For example, a delivery company may operate by auto, bus, plane, motorcycle, airboat, helicopter, pipeline, or ocean vessel depending on the type of goods to be moved and the intended destination. Following is a listing of many different types of transportation enterprises which will give you a better understanding of business opportunities in transportation:

- Ambulance service
- Automobile and limousine rental, with driver
- Bus charter service
- Farm to market hauling
- Garbage and refuse collecting
- Long-distance trucking
- Excursion boats
- Air taxis
- Travel agencies
- Horse drawn cabs
- Sightseeing buses
- Taxicabs
- School buses
- Baggage transfer
- Ferries
- Warehousing and storage
- Log rafting and towing
- Water taxis
- Marianas
- Flying charter service
- Freight rate information service

Who Are The Self-Employed

Although many people would like to own their own businesses, the self-employed account for only about 7 percent of the nonfarm work force. Nonfarm workers who are self-employed fall into three major groups:

1. Professional persons who are not businessmen as such but who are in business for themselves. Among persons in this category are lawyers, doctors, dentists, veterinarians, and optometrists. More than half the workers in each of these fields are self-employed. Others in the professional category include accountants, architects, writers, artists, and entertainers.

2. Persons in relatively low-paying enterprises which require few specialized skills and little monetary investment. These include workers such as street peddlers, babysitters, and persons who clean private homes. Workers in this group often turn to self-employment because other job opportunities are scarce, not because they desire independent work.

3. People who own their businesses - factories, barbershops, service stations, restaurants, taxicabs, stores, and a host of other establishments that sell goods or services. This group comprises the largest number of self-employed persons.

The drives that prompt professional workers and business proprietors to set out on their own are many and varied. A desire for independence is one of the major reasons leading to self-employment. No matter what their motivations,

workers who do turn to self-employment face working conditions much different from people who work for someone else.

Summary

In the next several weeks, you will gain a better idea of what is involved in starting your own business. There are definite advantages, as well as disadvantages, to such a venture. It is filled with risks. But knowledge and sound planning can minimize these risks.

SUGGESTED ACTIVITIES

1. What advantages can you see in starting career planning well in advance of the time a choice will be needed?

2. Describe what is meant by the following transportation enterprises:

   a. Charter service

   b. Baggage transfer

   c. Excursion boat

   d. Warehousing

   e. Marianas

   f. Pipelines

3. Complete Activity 1.1

4. Complete Activity 1.2

ACTIVITY 1.1

PRESENT CAREER GOALS

At the present time, my choice of an occupation is that of _____.

Now, think about what you want your life to be like in the future. For example, where you want to live, whether you want to be married and have a family, how you want to spend your leisure time, what personal items you want (house, auto, clothes), what type of friends you want to associate with. Write a short discription about these things below.

WHAT I WANT FROM LIFE . . .

in 5 years _____

_____

_____

in 10 years _____

_____

_____

in 25 years _____

_____

_____

Will the occupation you identified above allow you to reach your goals? _____

_____

ACTIVITY 1.2

CAREER PLANNING

Instructions: The statements which follow are concerned about your present career plans. Place an A beside those statements you agree with, and a D beside those you disagree with.

_____ 1. I know exactly what I am going to do after high school.

_____ 2. I will need additional education after high school for what I plan to do.

_____ 3. My high school education has prepared me for what I want to do in the future.

_____ 4. There is no sense in planning ahead because your interests change as you get older.

_____ 5. I am definitely going to pursue a career in transportation.

_____ 6. My parents have plenty of money, so I don't have to worry about the future.

_____ 7. I have no interest in owning my own business.

_____ 8. My school work would mean more if I could see how it related to my future.

_____ 9. Almost all work is difficult and boring.

_____10. I have a good idea of what things I am good at doing.

_____11. Work can be a great source of satisfaction.

_____12. I expect my career to be determined by what I make it.

_____13. There is little chance of working at what you really want to do.

_____14. When I see people working, I wonder what it would be like to do that.

_____15. I am pretty well informed about many different types of occupations.

Look over your answers above, place a check mark along the scale below which summarizes how satisfied you are with your present career plans.

well satisfied very sure	satisfied fairly sure	neutral	unsatisfied not sure	very unsatisfied very uncertain

READING 2

GOING INTO BUSINESS

In which the reader becomes aware of the advantages and disadvantages of owning a business.

So you are thinking of going into business! Individuals who are self-employed face working conditions very different from those of their salaried counterparts. Young people who want to become their own bosses should know the facts about self-employment before making any decisions to strike out on their own.

The Good News

To run a business of your own will bring a sense of independence - an opportunity to use your own ideas. You will be the boss. You can't be fired. You will have a chance for higher income because you can collect a salary plus a profit or return on your investment. You will experience a pride in ownership - such as you experience if you own your own home or your own automobile. You can achieve the great satisfaction of building a valuable investment for which there will be a market.

By being boss you can adopt new ideas quickly. Since your enterprise undoubtedly will be a small business - at least in the beginning - you will have no large, unwieldy organization to retrain each time you wish to try something new. This opportunity for flexibility will be one of your greatest assests.

The Bad News

Now, let us take a look at the other side. If you are an entrepreneur you must have money to pay creditors, dealers who furnish you fixtures and equipment, the landlord (if you rent), or the mortgage holder if you are buying your place of business, the publisher running your advertisements, the tax collector, and many others. You must accept sole responsibility for all final decisions. Wrong judgment on your part can result in losses not only to yourself but, possibly, to your employees, creditors, and customers as well. Moreover, you must withstand adverse situations caused by circumstances beyond your control, such as depressed economic conditions or strong competition.

To overcome these disadvantages and keep your business profitable means long hours of hard work. Invariably when you become your own boss you will work longer hours than when you were working for someone else. At least, this will be necessary in the beginning.

Then, after all, you will not be entirely your own boss. No matter what business you choose - whether a manufacturing, wholesaling, retailing, or service business - you must satisfy your customers. Your creditors and your competitors will dictate to you. Health authorities and insurance people will see that you meet certain standards and follow certain regulations. You will have to abide by wage and hour laws and keep records in accordance with the requirements of the tax system. A further discussion of the advantages and disadvantages of going into business is included in the next reading.

SUGGESTED ACTIVITIES

1. Independence is often given as a major reason for owning a business. Is the small business owner really independent? Consider how many persons the business owner depends on and how many persons likewise depend on him/her.

2. Given the same type of job, would you rather work for someone else for 40 hours a week at $200 dollars per week, or work for yourself for 50 hours at $200 per week. Why or why not?

3. Many new terms were used in this lesson with which you may not be familiar. Complete Activity 2.1.

4. Complete Activity 2.2.

ACTIVITY 2.1

VOCABULARY

Instructions: Consult a dictionary and write in your own words what each of the following terms mean:

Investment

Enterprise

Assets

Creditors

Fixtures

Mortgage holder

Wholesaling

Retailing

Depressed economic conditions

Competitors

ACTIVITY 2.2

INTERVIEW GUIDE

Instructions: Select a small business owner in your community. Interview him/her to gain a better idea of the working conditions of small business owners. Use the following questions as a guide in your interview.

1. Name of business _____

2. What goods are sold, or what services are provided? _____

_____

3. How many full-time people are employed? _____ Part-time employees?_____

Are there any other people who are employed on an occasional basis (attorney, bookkeeper)? _____

_____

4. What are the six most important job tasks that you perform?

_____ _____

_____ _____

_____ _____

5. What type of <u>educational</u> background did you have before you started this business? _____

_____

6. What type of <u>work experience</u> background did you have before you started this business? _____

_____

7. Which was more valuable, the educational experience or the work experience?

_____ Why? _____

_____

8. Have you taken any additional educational courses or training since opening the business? _____ If so, what kind? _____

_____

9. How many hours do you work each week? _____ How much vacation time do you have each year? _____

10. What three things do you like most about your business?

_____

_____

_____

11. What three things do you like the least?

_____

_____

_____

12. If you had to do it over again, would you do the same thing? _____

_____

_____

13. Use the additional space below for your own questions and comments.

READING 3

WHAT'S IT LIKE?

In which the reader becomes acquainted with a typical workday in the life of a small business owner.

No one individual can typify the experiences of all self-employed workers. However, the following case study will give you a better idea of the advantages and disadvantages of self-employment which were discussed in the previous reading. Len Kirsten's worklife (the person in this case study) does show many of the freedoms, uncertainties, and responsibilities shared by independent workers.

The Day Begins

On a typical workday, Len Kirsten of Washington, D.C. arrives at the Emporium, his small gift and card shop, at about 10 a.m. Stepping inside, he takes a sharp owner's look around the store, which holds a miscellaneous assortment of wares: crystal salad bowls, candles, neckties, place mats, scented soap, and kazoos are among the many items in stock.

The Emporium opens at 11 a.m. and Kirsten hurries to make sure everything is in order. He makes a fresh pot of coffee -- a bonus for early customers -- and checks to see that the store's shelves are well-stocked and tidy. Spotting a few gaps, he tells the two part-time sales clerks who have just arrived to replenish supplies of wrought iron candle holders and Japanese-design ashtrays. He also instructs the employees to unpack a recently arrived carton of stainless steel serving bowls, tag them with the price he has determined, and display them near the coffee mugs.

Anwering the Mail

Satisfied that everything is in order, Kirsten takes the morning mail upstairs to a small room filled with so many cardboard boxes that it looks more like a stockroom than an executive office. Settling down at his old wooden desk, he opens the mail, taking special note of new merchandise catalogs, bills, and a customer check which has bounced. He answers some of the correspondence and files the rest into appropriate piles for future action.

Kirsten spends the rest of the morning in his office filling out several government forms required of self-employed persons. He is interrupted by a telephone call from a supplier who regrets that Kirsten's latest order will be delayed for 3 weeks. Annoyed but unable to do anything about the shipment date, Kirsten shrugs the incident off as "one of the breaks of the business".

Unexpected Caller

A few minutes later, a manufacturer's representative unexpectedly walks in and tries to sell Kirsten a new line of paper placemats and napkins. Kirsten generally buys his merchandise from wholesale houses in New York City (which he visits about 6 times a year), but occasionally, he does buy from a visiting salesperson. Today he declines, however, believing that his current line of paper table items is adequate. Kirsten takes his time about making this decision, since his income hinges on his ability to make sound judgments about what his customers will buy. If he invests in an item which doesn't sell, he loses money.

Waiting on Customers

At 1 p.m., Kirsten goes back downstairs to relieve his clerks during their lunch hours. Before starting the Emporium 7 years ago, Kirsten enjoyed a 15-year career in public relations. He likes working with people and enjoys waiting on and talking to customers.

The clerks return and Kirsten grabs a quick lunch at a neighborhood delicatessan before running a business errand at the post office. He then takes time out for a haircut. Inasmuch as he is his own boss, Kirsten can take time off whenever he wants. Generally, however, he is reluctant to spend too much time away from the store, since there is always so much work there to be done.

Bookkeeping Too!

Back at his office, Kirsten goes over the books with his accountant, another self-employed person from outside his business, who keeps track of income and outgo and evaluates the store's performance. Looking at recent sales income and expenses, Kirsten briefly remembers the days when he received a fixed yearly income for his work as a salaried public relations specialist. In those days, he regularly collected a paycheck from which his employers had already withheld money for State and Federal income taxes. His share of payments for Social Security benefits, a health insurance plan, and other programs that assured him income during his old age or periods of sickness had also been deducted. And like most employers, the organizations for which he worked had paid part of the cost of these income protection plans.

Looking over the books, Kirsten is happy to see a good rate of profit. If the store's income had not met expenses for the last several months, he would have had to make up the difference out of his own savings. This rarely occurs nowadays, but, like many new businesses, the Emporium lost money during its first several months of operation.

Kirsten recalls vividly, too, how he had had to borrow money to start the business at all and first persuade a lender that he could succeed. Then there had been the years of meeting payments on the borrowed capital as well as interest for its use. These payments had to be made regularly, for a merchant is helpless without a good credit rating. As he looked back, Kirsten was gratified to see that it had all paid off.

End of a Long Day

Kirsten finishes conferring with his accountant at 6 p.m. and then goes downstairs to help wait on customers until the shop closes at 7. Several boxes of merchandise have arrived during the day, and Kirsten stays for an hour after closing to unpack and shelve a few items. He generally puts in at least a 9-hour workday -- not counting "time off" when he reads trade magazines to keep up with buying trends or thinks about new ideas for the store -- and works 6 days a week.

Efforts Pay Off

Every once in a while, Kirsten remembers "the old days" when he was salaried and worked a 40-hour, Monday-through-Friday week. He strongly believes, however, that the present freedom and challenge of being his own boss

and the knowledge that his efforts are paying off in money that goes into his own pocket more than make up for the long hours and other disadvantages.

SUGGESTED ACTIVITIES

1. Complete Activity 3.1.
2. Complete Activity 3.2.
3. View the film "New Entrepreneur". Discuss how Denise Cobb (in the film) and Len Kirsten are alike.

ACTIVITY 3.1

IDENTIFYING WORK TASKS

Instructions: In his role as a small business owner, Len Kirsten performs many different work tasks. In a large organization, such work tasks would probably be performed by a single person. Following is an example of what is meant. Add as many job tasks and job titles to this list as you can think of.

	Job Task	Job Title
1.	Supervises employees	Sales Manager
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		

(Use additional pages if needed)

ACTIVITY 3.2

ADVANTAGES AND DISADVANTAGES

Instructions: In the space below, list as many advantages and disadvantages as you can of being a small business owner.

	Advantages	Disadvantages
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

In your opinion, do the advantages outweigh the disadvantages? Record your answer below.

READING 4

ARE YOU THE TYPE?

In which the reader becomes aware of personality characteristics which are related to business success.

One of the first questions you should answer after recognizing that there are both advantages and disadvantages to owning your own business is, "Am I the type?" You will be your most important employee. It is more important that you rate yourself than it is that you rate a prospective employee. From the viewpoint of operating your own business, evaluate your strong points and weak points. If you recognize you are weak in salesmanship, for example, you should know it and cover that weakness by hiring the best sales talent you can afford.

Successful Managers

One study made of small business managers showed that successful managers possessed superior amounts of certain personality characteristics. In measuring "success", no one person or one business characteristic (such as total sales volume) was used to indicate success. Information was collected from the owner of the business as well as customers, suppliers, competitors, creditors and employees. The results of the study indicated that five personal characteristics were highly related to success. These characteristics were drive, thinking ability, human relations ability, communications ability and technical knowledge.

DRIVE, as defined in the study, is composed of responsibility, vigor, initiative, persistence, and health.

THINKING ABILITY consists of original, creative, critical, and analytical thinking.

HUMAN RELATIONS ABILITY is comprised of ascendance, emotional stability, sociability, cautiousness, personal relations, consideration, cheerfulness, cooperation, and tactfulness.

COMMUNICATIONS ABILITY is composed of verbal comprehension, oral communications, and written communications.

TECHNICAL KNOWLEDGE is the information managers have about the physical process of producing goods or services, and their ability to use this information purposefully.

Increasing Your Effectiveness

Motivation or drive has long been considered important to effective performance. Psychologists now claim that individuals can increase their drive. If you want to do so, you can develop the motivation and the personal capacities that will help you improve your effectiveness and increase your chances for success. Developing greater motivation and increasing your personal effectiveness depends a great deal on having a goal for yourself. Owning a small business might be the type of goal you need to pull yourself out of a rut!

Caution

Not all young people possess the personality characteristics required to be self-employed. Young people who wish to be their own bosses should be honest with themselves about their strengths and weaknesses. Success in self-employment is based on facts, not on wishful thinking. Remember in starting your own business, you are risking YOUR money and YOUR time.

Rating Yourself

Although you are biased, you will be asked to rate your personal characteristics. The purpose will be to determine whether you are the type to run your own business. The rating form to be used with this lesson is in no way designed to be a scientific, psychological test. It is merely designed to help you rate yourself in relation to characteristics which have been found to be related to successful business ownership. After rating yourself, you should have two other people complete the form who can evaluate you objectively. The results may startle you.

SUGGESTED ACTIVITIES

1. Are there any words in this reading of which you do not know the meaning? If so, look them up in a dictionary and share your findings with the class.
2. Describe in your own words what the following terms mean to you:

   Drive

   Thinking Ability

   Human Relations Ability

   Communications Ability

   Technical Knowledge

3. The study described in Reading 4 did not mention characteristics such as sex, race, social class, or religion as being related to business success. Why do you think that is the case?

4. Complete Activities 4.1, 4.2, 4.3 and 4.4 as follows:

   a. Follow the instruction in Activity 4.1 and rate yourself on the ten characteristics provided.

   b. Give Activity 4.2 to a family member and ask them to rate you with with respect to each of the ten statements.

   c. Give Activity 4.3 to someone for whom you have worked (if you have never worked - give it to a teacher). Ask them to rate you with respect to each of the ten statements.

   d. Complete the summary Activity 4.4. If you didn't rate as well as you should, remember, you still have time to change!

ACTIVITY 4.1

SELF RATING

Instructions: Under each question, circle the number (3,2 or 1) beside the answer that best describes you.

A. Are you a self-starter?

3 I do things on my own. Nobody has to tell me to get going.
2 If someone gets me started, I keep going all right.
1 Easy does it, man. I don't put myself out until I have to.

B. How do you feel about other people?

3 I like people. I can get along with just about anybody.
2 I have plenty of friends - I don't need anyone else.
1 Most people bug me.

C. Can you lead others?

3 I can get most people to go along when I start something.
2 I can give the orders if someone tells me what we should do.
1 I let someone else get things moving. Then I go along if I feel like it.

D. Can you take responsibility?

3 I like to take charge of things and see them through.
2 I'll take over if I have to, but I'd rather let someone else be responsible.
1 There's always some eager beaver around wanting to show how smart he is. I say let him.

E. How good an organizer are you?

3 I like to have a plan before I start. I'm usually the one to get things lined up when the gang wants to do something.
2 I do all right unless things get too goofed up. Then I cop out.
1 You get all set and then something comes along and blows the whole bag. So I just take things as they come.

F. How good a worker are you?

3 I can keep going as long as I need to. I don't mind working hard for something I want.
2 I'll work hard for a while, but when I've had enouth, that's it, man!
1 I can't see that hard work gets you anywhere.

G. Can you make decisions?

3 I can make up my mind in a hurry if I have to. It usually turns out O.K., too.
2 I can if I have plenty of time. If I have to make up my mind fast, I think later I should have decided the other way.
1 I don't like to be the one who has to decide things. I'd probably blow it.

H. Can people trust what you say?

3 You bet they can. I don't say things I don't mean.
2 I try to be on the level most of the time, but sometimes I just say what's easiest.
1 What's the sweat if the other fellow doesn't know the difference?

I. Can you stick with it?

3 If I make up my mind to do something, I don't let anything stop me.
2 I usually finish what I start - if it doesn't get fouled up.
1 If it doesn't to right away, I turn off. Why beat your brains out?

J. How good is your health?

3 Man, I never run down!
2 I have enough energy for most things I want to do.
1 I run out of juice sooner than most of my friends seem to.

ACTIVITY 4.2

RATING BY FAMILY MEMBER

Instructions: Under each question, circle the number beside the answer that best describes the person you are rating.

A. Are you a self-starter?

3 I do things on my own. Nobody has to tell me to get going.
2 If someone gets me started, I keep going all right.
1 Easy does it, man. I don't put myself out until I have to.

B. How do you feel about other people?

3 I like people. I can get along with just about anybody.
2 I have plenty of friends - I don't need anyone else.
1 Most people bug me.

C. Can you lead others?

3 I can get most people to go along when I start something.
2 I can give the orders if someone tells me what we should do.
1 I let someone else get things moving. Then I go along if I feel like it.

D. Can you take responsibility?

3 I like to take charge of things and see them through.
2 I'll take over if I have to, but I'd rather let someone else be responsible.
1 There's always some eager beaver around wanting to show how smart he is. I say let him.

E. How good an organizer are you?

3 I like to have a plan before I start. I'm usually the one to get things lined up when the gang wants to do something.
2 I do all right unless things get too goofed up. Then I cop out.
1 You get all set and then something comes along and blows the whole bag. So I just take things as they come.

F. How good a worker are you?

3 I can keep going as long as I need to. I don't mind working hard for something I want.
2 I'll work hard for a while, but when I've had enough, that's it, man!
1 I can't see that hard work gets you anywhere.

G. Can you make decisions?

3 I can make up my mind in a hurry if I have to. It usually turns out O.K., too.
2 I can if I have plenty of time. If I have to make up my mind fast, I think later I should have decided the other way.
1 I don't like to be the one who has to decide things. I'd probably blow it.

H. Can people trust what you say?

3 You bet thay can. I don't say things I don't mean.
2 I try to be on the level most of the time, but sometimes I just say what's easiest.
1 What's the sweat if the other fellow doesn't know the difference?

I. Can you stick with it?

3 If I make up my mind to do something, I don't let anything stop me.
2 I usually finish what I start - if it doesn't get fouled up.
1 If it doesn't go right away, I turn off. Why beat your brains out?

J. How good is your health?

3 Man, I never run down!
2 I have enough energy for most things I want to do.
1 I run out of juice sooner than most of my friends seem to.

ACTIVITY 4.3

RATING BY EMPLOYER

Instructions: Under each question, circle the number beside the answer that best describes the person you are rating.

A. Are you a self-starter?

3 I do things on my own. Nobody has to tell me to get going.
2 If someone gets me started, I keep going all right.
1 Easy does it, man. I don't put myself out until I have to.

B. How do you feel about other people?

3 I like people. I can get along with just about anybody.
2 I have plenty of friends - I don't need anyone else.
1 Most people bug me.

C. Can you lead others?

3 I can get most people to go along when I start something.
2 I can give the orders if someone tells me what we should do.
1 I let someone else get things moving. Then I go along if I feel like it.

D. Can you take responsibility?

3 I like to take charge of things and see them through.
2 I'll take over if I have to, but I'd rather let someone else be responsible.
1 There's always some eager beaver around wanting to show how smart he is. I say let him.

E. How good an organizer are you?

3 I like to have a plan before I start. I'm usually the one to get things lined up when the gang wants to do something.
2 I do all right unless things get too goofed up. Then I cop out.
1 You get all set and then something comes along and blows the whole bag. So I just take things as they come.

F. How good a worker are you?

3 I can keep going as long as I need to. I don't mind working hard for something I want.
2 I'll work hard for a while, but when I've had enough, that's it, man!
1 I can't see that hard work gets you anywhere.

G. Can you make decisions?

3 I can make up my mind in a hurry if I have to. It usually turns out O.K., too.
2 I can if I have plenty of time. If I have to make up my mind fast, I think later I should have decided the other way.
1 I don't like to be the one who has to decide things. I'd probably blow it.

H. Can people trust what you say?

3 You bet they can. I don't say things I don't mean.
2 I try to be on the level most of the time, but sometimes I just say what's easiest.
1 What's the sweat if the other fellow doesn't know the difference?

I. Can you stick with it?

3 If I make up my mind to do something, I don't let anything stop me.
2 I usually finish what I start - if it doesn't get fouled up.
1 If it doesn't go right away, I turn off. Why beat your brains out?

J. How good is your health?

3 Man, I vever run down!
2 I have enough energy for most things I want to do.
1 I run out of juice sooner than most of my friends seem to.

ACTIVITY 4.4

INTERPRETING YOUR RATINGS

Total the number of points from each of the three forms and record your answer at the right:

_____Self

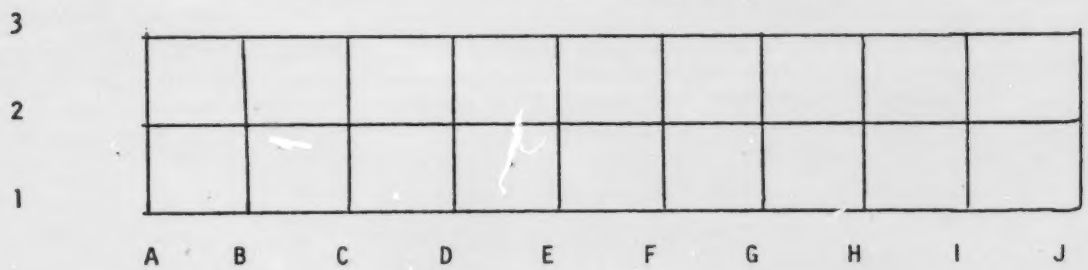
_____Family Member

_____Employer

Who gave you the highest rating? _____, Next highest? _____,

Lowest? _____.

Now, chart your three ratings below. Use three different color pencils, or three different type lines (solid line, dotted line, slash line).



In the space below, summarize your interpretation of the chart.

_____

_____

_____

_____

What could you do to improve your weaknesses?

_____

_____

Are you the type? _____

READING 5

WHAT BUSINESS SHOULD YOU CHOOSE?

In which the reader considers how to select a specific business related to her/his area of interest.

Since you are enrolled in a class related to transportation, you are probably planning a transportation career in one of the areas discussed in Reading 1. A number of choices are possible. This reading will help you to consider how you might begin to choose.

Your Own Background

You might start by writing out a summary of your background and experience. Include that obtained in jobs, in school, and from your hobbies. Then write down what you would like to do. Try to match up what you would like to do with what you have done. If you do not like the business you choose, your lack of enthusiasm may lead to failure. But, in making your selection, remember that the more experience and training you have had which can be put to direct use in operating a particular enterprise, the better your chances of success.

So pick the field you know most about. The best way to obtain knowledge of a business is through actual experience in it. If you feel otherwise qualified, but lack sufficient training, seek a job working for somebody else in the business you are considering. Try to find a position in a well-managed, successful company. Then absorb as much management know-how as you possibly can.

You will need every minute of experience you can get. Exactly how much you will need as a minimum depends upon the business and upon your general business knowledge. Experience in other types of work may teach you something about general business policies and operating methods. The transfer of experience from one type of business to another is often possible.

Education will help, too. While there are usually no educational requirements for starting your own business, the more schooling you have had the better equipped you should be. For example, in most businesses you must know how to figure interest and discounts, keep simple and adequate records, and conduct necessary correspondance. Knowledge of these and many other helpful subjects may be acquired through formal education.

Other Peoples Needs

Next, make a sincere effort to determine as best you can whether customers will need or want the type of business you are interested in. Do not take anything for granted. For example, just because air, rail, and bus services may already exist to meet people's needs, that doesn't mean customers may not want a different type of transportation. Following is a portion of an article which appeared in the June 29, 1975 Southern Illinoisan newspaper that illustrates a good case in point.

"Magic Bus" goes to Chicago

Based on the proposition that going there should be just as much fun as arriving, a bus service from Carbondale to Chicago is beginning Friday, Southern Illinois student Mark Sanders said.

Sanders and Dave "DC" Erlandson, another student, have purchased an air-conditioned and stereo-equipped van for their Magic Bus Co. They will take 10 persons on weekend trips to Chicago for $25 per round-trip.

Opportunities for Growth

The business you are thinking about in transportation should be in tune with the trend of the times. Choose a field in which expansion is logically expected. You will need to study surveys and seek advise from people who are in a position to know. Reference sources such as the Occupational Outlook Handbook will help you in studying past trends and in studying the outlook for the future.

Successful business managers are people who make accurate predictions for the future. They are also people who adjust to unforseen events. You will need to consider how conditions such as the fuel shortage and pollution problems are likely to influence the nature of transportation.

Summary

In conclusion, start with what you are equipped to offer. What can you do with your present preparation? Does anyone need transportation services that are not available? Does anyone want a different type of service (such as the Magic Bus Company)? What's the future going to be like for the business you are interested in?

SUGGESTED ACTIVITIES

1. Define the difference between a need and a want.

2. Many small businesses such as the "Magic Bus" company have begun while the owners have been students. Can you think of any other successful businesses that have been started by students?

3. Complete Activity 5.1.

4. Complete Activity 5.2.

5. Complete Activity 5.3.

ACTIVITY 5.1

BACKGROUND AND EXPERIENCE

Instruction: Knowledge of your own background and experience can be useful in selecting an appropriate buiness. Complete the following questions which summarize your career to date.

1. In what type of high school program are you currently enrolled (check one)? College preparatory_____. General_____. Vocational_____.

2. What is your average grade point average for all high school courses you have taken to date (check one)? A____. B____. C____. D____.

3. What school subject do you like best? _____

_____.

4. What school subjects do you like least? _____

_____.

5. How do you rate on the following educational skills (check one)?

	strong	average	weak
a. Understanding what I read.	___	___	___
b. Understanding what I hear in class.	___	___	___
c. Writing term papers.	___	___	___
d. Ability to work with numbers - math skills	___	___	___
e. Ability to solve problems	___	___	___
f. Knowing how to study	___	___	___
g. Completing assignments on time	___	___	___
h. Cooperating with teachers	___	___	___
i. Cooperating with other students	___	___	___

6. Do you have any unique educational abilities that are not mentioned above?

_____

_____

7. List below the type of jobs you have held in the past (full or part-time). For each job, describe the duties you performed.

Job _____ Job _____

_____ _____

_____ _____

_____ _____

Job _____ Job _____

_____ _____

_____ _____

_____ _____

8. How do you rate on the following occupational skills (check one)?

	strong	average	weak
a. Typing	___	___	___
b. Working with tools and machines	___	___	___
c. Selling ability	___	___	___
d. Completing work on time	___	___	___
e. Driving ability	___	___	___
f. Cooperating with employer	___	___	___
g. Cooperating with other employees	___	___	___

9. Do you have any unique occupational abilities that are not mentioned above?

_____

_____

10. Based on your background and experience, above, how qualified are you now to go in business for yourself?

_____

_____

11. Did this activity suggest any possible businesses you would be good at doing? _____. If so, what are they? _____

_____

_____

ACTIVITY 5.2

NEEDS AND WANTS

Instructions: Select three people from different walks of life. In the left hand column, ask them what types of transportation services they need in their work and leisure activities. In the right hand column, ask them if there are any different types of services they want that are not available.

Person #1_____

Needs	Wants
_____	_____
_____	_____
_____	_____

Person #2_____

Needs	Wants
_____	_____
_____	_____
_____	_____
_____	_____

Person #3_____

Needs	Wants
_____	_____
_____	_____
_____	_____

Summary: Based on the above information, name several types of transportation businesses you could pursue.

_____

_____

ACTIVITY 5.3

PREDICTING THE FUTURE

Instructions: Starting a business in transportation should be done with knowledge of what the future is likely to be. Following are four statements which make predictions about what the society will be like in the future. Under each statement discuss how such trends may effect transportation services.

1. Gasoline and other fuels which come from oil are running out. Oil will probably be more scarce in 1980. What does this mean for small business opportunities in transportation?

2. The use of automobiles is polluting the environment. Pollution will be worse in 1980. What does this mean for small business opportunities in transportation?

3. Unemployment in the U.S. was at 9% in the summer of 1975. High unemployment will probably continue through 1980. What does this mean for small business opportunities in transportation?

4. The birth rate in the U.S. is dropping and will probably continue to drop in the future. At the same time, the percentage of older people is growing in relation to the total population. What does this mean for small business opportunities in transportation?

READING 6

YOUR CHANCES OF SUCCESS

In which the reader becomes aware of various conditions which may cause businesses to fail

What are your chances of success if you go into business? For one thing the number of businesses in this country is growing. In 1900 there were about 1.7 million business firms in the United States. In 1972 there were approximately 8 million small businesses. While population is growing, too, the number of businesses is growing somewhat faster, with 27 firms per 1000 population in 1971 as contrasted to 22 per 1000 in 1900. This does not mean that the number increases at a steady pace year-after-year. For instance a year of poor business conditions is likely to be followed by a greater than average number of failures or discontinuances, causing the total number of business firms to drop. On the other hand a year or years of good business conditions tends to be followed by large increases in the total number of businesses. In general, the number of firms increases along with increases in human population, total personal income, and per capita income.

First Five Years Are Critical

This growth is not free of growing pains, however. At the same time that new businesses are being born other businesses are being discontinued. Some of these discontinuances are legally business failures. Others give up to avoid or minimize losses and are not failures in the strict sense. Still others discontinue for other reasons; such as the death or retirement of the proprietor, the dissolution of a partnership, or the sale of the business to a new owner.

The younger businesses tend to discontinue first. Of all new firms started, about one-third are discontinued within one year; about 50 percent are discontinued within 2 years; and approximately two-thirds within 5 years. After 5 years, the discontinuation rate drops rapidly. So, your chances of success improve the longer you stay in business.

Causes of Business Failures

Dun and Bradstreet, Inc., a company which provides a variety of information services for businesses, regularly studies the reasons for business failures. After looking at 10,326 firms that went under in 1971, the company reported that 93 percent failed because of the owners' lack of experience in the field, lack of managerial experience, lack of enough experience in all phases of business, or incompetence. These shortcomings resulted in difficulties such as poor choices of location, inadequate sales, inability to compete with other firms, inability to collect money owed the companies, and very high operating expenses.

Conditions Beyond Your Control

Many factors adversly affect individual firms over which the owners have little control. But even in such cases, the astute manager can often soften the blow or, sometimes, change adversity into an asset. Examples of factors over which the owner has little control are overall poor business conditions, relocations of highways, sudden changes in style, the replacement of existing products by new products, and local labor situations. While these factors may cause some businesses to close, they may represent opportunities for others. One local market place may decline in importance, but at the same time new

shopping centers are developing. Sudden changes in style or the replacement of existing products may bring trouble to certain businesses but open doors for new ones. Adverse employment situations in some areas may be offset by favorable situations in others. Ingenuity in taking advantage of changing consumer desires and technological improvements will always be rewarded.

In the final analysis, it is up to you. Will your management be competent? Will you be able to judge, and then satisfy, your customer's wants? Can you do this so accurately and quickly that risks due to factors beyond your control will be more than compensated for? Such accomplishments require expert management.

SUGGESTED ACTIVITIES

1. Are there any words in this reading of which you do not know the meaning? If so, look them up in a dictionary and share your findings with the class.

2. What is meant by the statement: "In general, the number of firms, increases along with increases in human population, total personal income, and per capita income."

3. What are the four main factors reported by Dun and Bradstreet which result in business failures?

   A.

   B.

   C.

   D.

4. Complete Activity 6.1.

ACTIVITY 6.1

CAUSES OF BUSINESS FAILURE

Instructions: Business failures may be caused either by poor management or caused by conditions over which the owner has little control. Following is a list of statements which may contribute to business failure. Beside each statement, indicate as follows:

PM = those which result from poor management
LC = those over which the owner has little control

_____ 1. Poor choice of location.

_____ 2. Building condemned by fire marshal.

_____ 3. Inability to collect money owned the company.

_____ 4. Congress increases income tax on businesses.

_____ 5. Forgot to place ad in yellow pages.

_____ 6. Refuses to modernize and replace worn out equipment.

_____ 7. Tornado demolishes building.

_____ 8. Thieves highjack delivery truck.

_____ 9. Jealous husband of secretary shoots business partner.

_____10. Overexpands inventory.

_____11. Strike by employees.

_____12. Shortage of gasoline.

_____13. Falsifies income tax and IRS sends him to jail.

_____14. Overprices services in relation to competitors.

_____15. Bookkeeper embezzles company funds.

_____16. Stock market collapses sending country into a depression.

_____17. Fails to keep informed of new products and new business practices.

_____18. Giant corporations reduce prices to squeeze out small businesses.

_____19. Inadequate sales.

_____20. Believes that cheapest way of doing business is the best way.

READING 7

YOUR RETURN ON INVESTMENT

In which the reader considers how much money can be expected from various lines of business.

Will the rate of return on the money you invest in your business be greater than the rate you could receive if you invested the money elsewhere? While your decision to go into business for yourself may not depend entirely upon this, it is one of the factors which will interest you. Too frequently individuals invest money in their own business under the misapprehension that the financial return will be far greater than the return available from other investments. Some investigation of the average annual returns in the line of business in which you are interested is worthy of your time.

Figuring Rates of Return

Table 1, page 2 shows the median percentage return on the original investment for 14 different types of business. The percentages were obtained by dividing the amount of net profits before taxes by the tangible net worth for that line of business.

A. Net profits = $125,000
B. Tangible net worth = $200,000
C. A divided by B = % return on investment

EXAMPLE: $125,000 ÷ $200,000 = 62.5%

Thus, the percentage return for this business would be 62.5 percent.

Median Returns

The percentage returns for the 14 types of business shown in Table 1 are median percentages. The median percentage is the middle score in a column of

TABLE 1

PERCENT RETURN ON INVESTMENT (1970)

Business	Median
MANUFACTURING	
Commercial Printing	17.6
Electric Components	5.3
Plastic Products	24.3
WHOLESALING	
Automotive Equipment	18.8
Building Materials	8.6
Hardware and Paints	11.0
Industrial Chemicals	15.7
RETAILING	
Automobiles, new and used	12.2
Furniture	9.9
Lumber Yards	3.4
SERVICING	
Auto and Truck Rental	19.9
Laundries and Dry Cleaners	2.8
Local Trucking	18.7
Real Estate Agents	11.4

figures. Look at the following columns of percentages for long distance trucking companies.

Company	A	34.6
"	B	23.8
"	C	12.2
"	D	9.6
"	E	1.4

You can see that Company C is the middle or half-way figure. Half of the percentage ratios are above 12.2 and half are below 12.2. Remember, that in the year 1970, 50% of the long distance trucking companies earned more than the 12.2% return on investment, and 50% earned less.

By showing percentages in this way, you gain an idea of the different returns on investment for various types of business. Some caution should be used in considering these ratios because they show results for only one year. It is important, however, to have some idea of what the experience has been in the line of business you are considering.

Other Rewards Are Important Too

Your decision to go into business may not depend entirely on financial rewards. The potential return on investment may be overshadowed by your desire for independence, the chance to do the type of work you would like to do, the opportunity to live in the part of the country or city you prefer, or the feeling that you can be more useful to the community than you would be if you continued working for someone else. Other such considerations must not be overlooked. Nevertheless, you cannot keep your own business open unless you receive a financial return on your investment.

SUGGESTED ACTIVITIES

1. Define what is meant by the following terms:

   Median

   Net profits

   Tangible net worth

2. Following are a number of different types of investments. What is the average rate of return that you could expect from each one? Invite a local investment broker or banker to come and help you answer these.

   a. U.S. Government Savings Bonds, Series E_____.
   b. U.S. Government Savings Bonds, Series H_____.
   c. Savings account in local bank_____.
   d. Certificate of deposit_____.
   e. Real estate_____.
   f. Mutual funds_____.
   g. Common stocks_____.
   h. Gold coins_____.

3. Complete Activity 7.1.

4. Complete Activity 7.2.

ACTIVITY 7.1

FIGURING PERCENTAGE RATIOS

Instructions: For each of the Companies below, compute the percentage of return on investment received.

	Company 1	Company 2	Company 3	Company 4
A. Net profit before taxes	$90,000	$165,000	$73,000	$25,000
B. Tangible net worth	$120,000	$150,000	$500,000	$1,000,000
C. Return on investment	_____	_____	_____	_____

Instructions: For each of the columns of percentage returns, what is the median figure?

1	2	3	4
94.4	33.7	23.9	9.4
58.6	24.3	40.8	15.1
51.4	21.6	18.7	8.3
36.7	17.6	27.2	9.9
35.6	16.7	54.8	29.1
34.1	15.7	32.1	13.3
25.8	11.3	32.7	12.5
21.3	8.6	42.2	16.6
16.9		33.9	
Median _____	_____	_____	_____

Did you enjoy these exercises? Your answer will tell you something about whether you should be a business owner.

_____

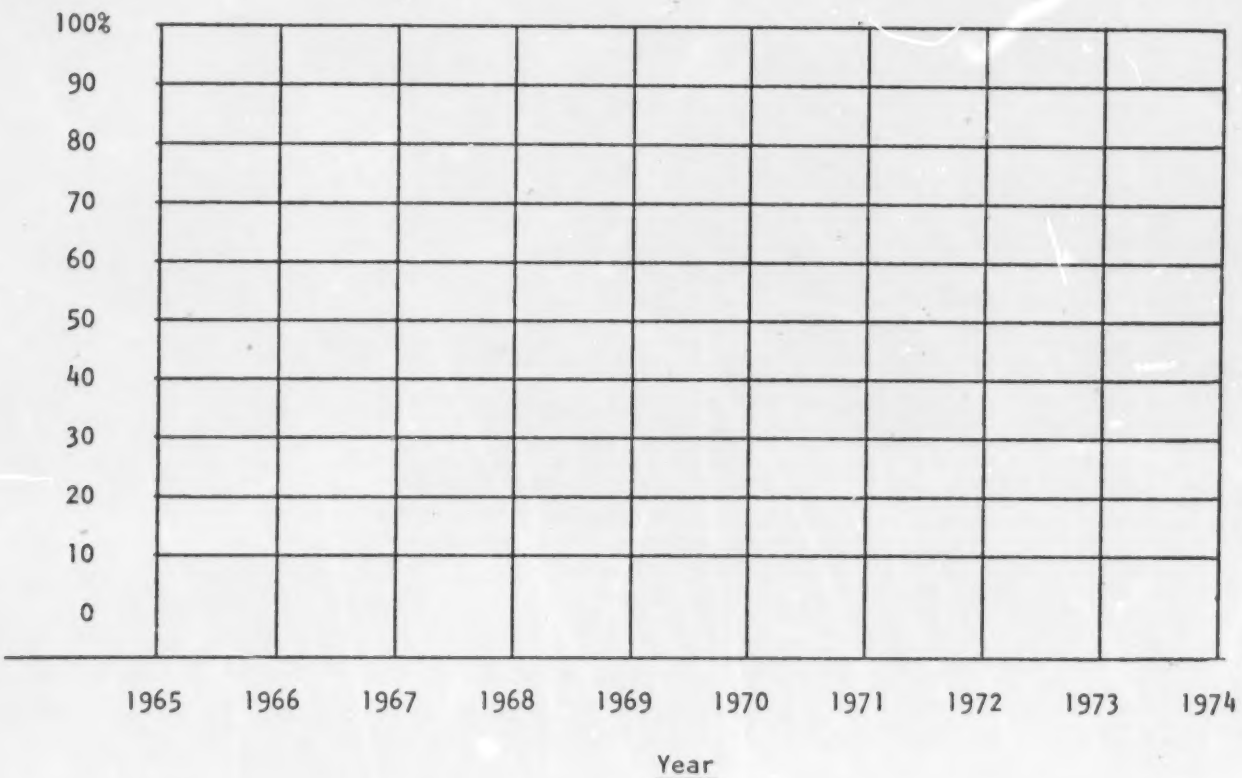
_____

ACTIVITY 7.2

CASE STUDY

Instructions: Select some type of transportation business. With the help of your instructor, business teacher, school or local librarian, obtain reference sources which contain financial statements of various businesses. Figure the percentage of return on investment for that company during the last 10 years. Chart your answers on the graph below.

Name and type of business _____.



1. What was the average rate of return for this company during the last 10 years?

   _____

2. In what year was this company's earnings the highest? _____. The lowest? _____. Now compare these two years with what your classmates found. Were these two years also good and bad years for other companies?

   _____

   _____

READING 8

STILL INTERESTED?

In which the reader learns about resources available to help the small business owner.

Young people who are interested in self-employment need to take a long, hard look at themselves and at the demands of self-employment. You should weigh the potential rewards and satisfactions against the risks and responsibilities. You should take care not to overestimate the rewards and satisfactions or underestimate the risks and responsibilities. If you are still interested, you should begin to take the kinds of courses that will help you prepare to manage a business. You should try to find employment related to the occupational area you are interested in. You should also talk to your vocational education director about enrolling in a cooperative vocational education program in which you can combine work and school.

Available Information

In addition to preparing for your future through education and work, you should begin to collect information about small business management which is available from many sources. Your teacher will provide you with handout materials. Following are the major sources of information you should be acquainted with.

The Small Business Administration

The Small Business Administration (SBA) is an independent government agency

created by Congress in 1953. The purpose of the SBA is to encourage, assist and protect the interests of small businesses. The agency provides many different types of services. The three main types of services are discussed below.

Loans. SBA can help prospective small business owners determine how much money they need to establish a business. Then, SBA can make a direct loan or help obtain a loan in cooperation with a bank or other lending institutions. Special arrangements are available to help persons who are handicapped or who are members of a minority.

Publications. One of the most important things you can do at this point is to begin educating yourself. SBA provides a wide variety of free and for-sale publications. Among the free publications are:

MANAGEMENT AIDS - discussions of the various phases of managing a small manufacturing business including accounting, financial management, personnel management, purchasing and market research.

TECHNICAL AIDS - facts on recent developments in fields such as manufacturing materials, processes, equipment and maintenance.

SMALL BUSINESS BIBLIOGRAPHIES - reference sources for individual types of businesses such as "Home Businesses", "Hobby Shops" and "Trucking and Cartage".

SMALL MARKETERS AIDS - discussion of the various phases of managing a small business including advertising, building good customer relations, and income tax reporting.

Among the for-sale publications are:

SMALL BUSINESS MANAGEMENT SERIES - booklets on specific management subjects such as "Financial Recordkeeping for Small Stores" and "Improving Materials Handling in Small Businesses".

STARTING AND MANAGING SERIES - pamphlets on general good practices in starting and managing a business. Also, pamphlets in starting and managing specific kinds of businesses, such as restaurants, carwashes, and pet shops.

Management assistance. Most businesses fail for lack of good management. For this reason, SBA offers courses and workshops for both prospective owners

and those who already operate a business. SBA also offers individual counseling assistance on almost any type of problem. Most of these services are free or very inexpensive.

The Small Business Reporter.

The Bank of America publishes a series of booklets entitled the Small Business Reporter. These publications are of three types: Business Profiles, Business Operations, and Professional Management. The topics covered are very similar to the SBA publications. However, you will still want to examine the list of available publications from the Bank of America. You can't have too much information on a subject as important as owning your own business.

Public Libraries

In addition to the school library, your local public library will have copies of newspapers, magazines and books that will be useful to you. Most librarians are very willing to help you locate information. Often, they can obtain a specific publication on loan from another library if it is not available locally.

It's Up To You

Successful small business owners are usually persons who know what they want and know how to go about getting it. Many small business owners are persons who have educated themselves by taking advantage of free and inexpensive services and information. If you really want to be independent, you can begin by educating yourself. A number of people are available to help you, but you have to be the one who makes the first move.

Activity 8.1 which accompanies this lesson, provides a checklist related to what you need to know and do. Don't be discouraged by the fact that most of your answers will be NO. Even though you are concerned right now with the section "Before You Start", other sections of the checklist on "Getting Started" and "Making It Go" will help you identify information you need.

SUGGESTED ACTIVITIES

1. Now that you have studied about entrepreneurship in transportation, are you more or less interested in the subject?

2. Have you looked at the list of publications your teacher has from the Small Business Administration and from the Bank of America? Make a list on a separate sheet of the ones you are most interested in.

3. Complete Activity 8.1. This checklist will help you plan what you need to do next to start your own business.

ACTIVITY 8.1

CHECKLIST FOR GOING INTO BUSINESS

Instructions: Here are some questions to help you think through what you need to know and do in starting a business. Check (✓) each question if the answer is YES. Where the answer is NO, you have some work to do.

BEFORE YOU START

How about YOU?

_____ Are you the kind of person who can get a business started and make it go? (Refer to Activity 4.4)

_____ Think about why you want to own your own business. Do you want to badly enough to keep yourself working long hours without knowing how much money you'll end up with?

_____ Have you worked in a business like the one you want to start?

_____ Have you worked for someone else as a foreman or manager?

_____ Have you had any business training in school?

_____ Have you saved any money?

How about the money?

_____ Do you know how much money you will need to get your business started?

_____ Have you counted up how much money of your own you can put into the business?

_____ Do you know how much credit you can get from your suppliers - the people you will buy from?

_____ Do you know where you can borrow the rest of the money you need to start your business?

_____ Have you figured out what net income per year you expect to get from the business? Count your salary and your profit on the money you put into the business.

_____ Can you live on less than this so that you can use some of it to help your business grow?

_____ Have you talked to a banker about your plans?

How about a partner

_____ If you need a partner with money or know-how that you don't have, do you know someone who will fit - someone you can get along with?

_____ Do you know the good and bad points about going it alone, having a partner, and incorporating your business?

_____ Have you talked to a lawyer about it?

How about your customers?

_____ Do most businesses in your community seem to be doing well?

_____ Have you tried to find out whether stores like the one you want to open are doing well in your community and in the rest of the country?

_____ Do you know what kind of people will want to buy what you plan to sell?

_____ Do people like that live in the area where you want to open your store?

_____ Do they need a store like yours?

_____ If not, have you thought about opening a different kind of store or going to another neighborhood?

GETTING STARTED

Your building

_____ Have you found a good building for your store?

_____ Will you have enough room when your business gets bigger?

_____ Can you fix the building the way you want it without spending too much money?

_____ Can people get to it easily from parking spaces, bus stops, or their homes?

_____ Have you had a lawyer check the lease and zoning?

Equipment and supplies

_____ Do you know just what equipment and supplies you need and how much they will cost?

_____ Can you save some money by buying secondhand equipment?

Your merchandise

_____ Have you decided what things you will sell?

_____ Do you know how much or how many of each you will buy to open your store with?

_____ Have you found suppliers who will sell you what you need at a good price?

_____ Have you compared the prices and credit terms of different suppliers?

Your records

_____ Have you planned a system of records that will keep track of your income and expenses, what you owe other people, and what other people owe you?

_____ Have you worked out a way to keep track of your inventory so that you will always have enough on hand for your customers but not more than you can sell?

_____ Have you figured out how to keep your payroll records and take care of tax reports and payments?

_____ Do you know what financial statements you should prepare?

_____ Do you know how to use these financial statements?

_____ Do you know an accountant who will help you with your records and financial statements?

Your store and the law

_____ Do you know what licenses and permits you need?

_____ Do you know what business laws you have to obey?

_____ Do you know a lawyer you can go to for advice and for help with legal papers?

Protecting your store

_____ Have you made plans for protecting your store against thefts of all kinds-shoplifting, robbery, burglary, employee stealing?

_____ Have you talked with an insurance agent about what kinds of insurance you need?

Buying a business someone else has started

_____ Have you made a list of what you like and don't like about buying a business someone else has started?

_____ Are you sure you know the real reason why the owner wants to sell his business?

_____ Have you compared the cost of buying the business with the cost of starting a new business?

_____ Is the stock up to date and in good condition?

_____ Is the building in good condition?

_____ Will the owner of the building transfer the lease to you?

_____ Have you talked with other businessmen in the area to see what they think of the business?

_____ Have you talked with the company's suppliers?

_____ Have you talked with a lawyer about it?

MAKING IT GO

Advertising

_____ Have you decided how you will advertise? (Newspapers - posters - handbills - radio - by mail?)

_____ Do you know where to get help with your ads?

_____ Have you watched what other stores do to get people to buy?

The prices you charge

_____ Do you know how to figure what you should charge for each item you sell?

_____ Do you know what other stores like yours charge?

Buying

_____ Do you have a plan for finding out what your customers want?

_____ Will your plan for keeping track of your inventory tell you when it is time to order more and how much to order?

_____ Do you plan to buy most of your stock from a few suppliers rather than a little from many, so that those you buy from will want to help you succeed?

Selling

_____ Have you decided whether you will have salesclerks or self-service?

_____ Do you know how to get customers to buy?

_____ Have you thought about why you like to buy from some salesmen while others turn you off?

Your employees

_____ If you need to hire someone to help you, do you know where to look?

_____ Do you know what kind of person you need?

_____ Do you know how much to pay?

_____ Do you have a plan for training your employees?

Credit for your customers?

_____ Have you decided whether to let your cutomers buy on credit?

_____ Do you know the good and bad points about joining a credit-card plan?

_____ Can you tell a deadbeat from a good credit customer?

A FEW EXTRA QUESTIONS

_____ Have you figured out whether you could make more money working for someone else?

_____ Does your family go along with your plan to start a business of your own?

_____ Do you know where to find out about new ideas and new products?

_____ Do you have a work plan for yourself and your employees?

_____ Have you gone to the nearest Small Business Administration office for help with your plans?